Technology and Motivation to Exercise: Data Display Formats, Progress Feedback, and Strength of Commitment for Personal Fitness

Honors Thesis

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By

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Abstract

The purpose of this study, inspired by observations of the increased use of data-driven fitness activity trackers, is to measure how using different methods to display the same set of data influences perceptions of its value: understanding of the data, informative value of the display, and motivation to take action or change behavior. Previous research predominantly focuses on the effectiveness of wearables, not their displays. For this study, data was collected from 273 respondents: an approximately equal number of males and females ranging in age from 18 to 72 (average age of 31) from OSU undergraduates and Amazon's Mechanical Turk. Participants evaluated different charts, tables, and graphs created from the same data set: 2 line graphs, 2 bar graphs, 1 pie chart, 1 table, 1 radar graph, and 3 visual displays. Questions assessed interpretation and understanding of the material as well as personal perception of the informational and motivational value of the displays. Respondents ranked motivational power of the displays in the following order (most to least): visual display, table, pie chart, line graph. Need for Cognition was included, and both those in the top 25% and the bottom 25% answered a context question more accurately using a table than a line graph despite looking at the table for less time. Respondents rated display characteristics related to data and information more important than appearance-related characteristics. Display format does influence the severity of inferences people deduce from data, and how meaningful they find the information to be. These results can be applied to the health and medical fields in general by providing insight into data display formats that are more likely to promote healthy diets, exercise, and other regimes such as medical prescription adherence.

Acknowledgments

I would like to express my sincere gratitude to the members of my thesis committee. First and foremost, my advisor, Dr. Curtis P. Haugtvedt, has been instrumental in helping me conceive the premise of this research as well as organizing the logistics. I am grateful that he helped me formulate a research question based on the experiences and observations I acquired over the summer of 2015 working as a technological advisory intern for Ernst and Young (EY) in Los Angeles. My responsibilities included training employees on self-service reporting platforms that I had helped develop and test, and I noticed that some reports and their displays were consistently easier for the employees to understand. Curt encouraged me to use my knowledge of creating different display formats to actually test this observation, and with his prior research in persuasive technology we were able to quantify the results. I would also like to thank Professor Bettina Bair for graciously agreeing to serve on the committee. As my Software I instructor in the autumn of 2015, she is one of the most helpful and clear instructors I have ever had throughout my college career. I highly respect her as an academic and individual, and I am excited to share my research with someone who has a more technical-based viewpoint. I have spent nearly as much time in the College of Engineering as I have at Fisher, so I am happy to have the engineering community represented. Finally, I would like to extend my thanks to Dr. Patricia West, who introduced me to all of the resources for research that I would have struggled to understand on my own. She extended the same opportunities to me as she did with her Honors Contract students, and I was not disadvantaged in any way. Thank you all!

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Fields of Study

Major Field: Management Information Systems

Minor Field: Computer Information Sciences

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Chapter 1: Background and Prior Research

Observations of the increased use of data-driven fitness activity trackers inspired this study. Even though it is a novel technology, Fitbits are shown to be an accurate, reliable, and efficient tool for tracking physical activity through mobile devices and a growing number of digital apps (Diaz, 2015). The inclusion of internet technology in the Fitbit offers a significant advantage over traditional tracking devices such as pedometers because it is able to integrate with internet-delivered fitness interventions, which are shown to be effective in producing small changes in physical activity (Tully, 2014).

Since 1950, sedentary jobs have increased 83% and less than 20% of jobs are considered physically active ("The Price of Inactivity," 2015). In contrast, wearables are expected to grow at a compound annual rate of 35% over the next five years from 2015, and fitness bands and other miscellaneous devices account for 36% of the wearable device market with 33 million units shipped this past year ("The Wearables Report," 2015). In an increasingly fast-paced society, consumers are compensating for not having time to exercise by incorporating more physical activity into their daily routines (Tully, 2014).

Due to Fitbits still being a relatively new technology, the majority of current published research only focuses on whether or not Fitbits and other fitness activity trackers are effective in promoting healthier lifestyles. They do not test to see if some display formats induce more of an impact or emotional response than others. This study seeks to determine if the level of effectiveness in using fitness activity trackers can vary

based on the format in which people's progress data is shown. Specifically, format is defined as different types of charts and graphs that display data.

Using different methods to display the same set of data may influence people's perception of its value: understanding of the data, informativeness of the display, and motivation to take action or change behavior. Some displays from current fitness activity trackers are shown below; these trackers typically visualize a user's physical activity, calorie intake and expenditure, sleep patterns, and progress towards a certain goal.

Figure 1*: Different ways in which progress data is displayed on fitness activity trackers and their apps; the graphics shown here are pulled from the dashboards of the Fitbit Force, Fitbit Charge, and Apple smartwatch.*

Though not applied to fitness activity trackers specifically, prior research has shown that how information is displayed does influence how it is perceived. In a 2012 literature study by Hildon, Allwood, and Black titled the "Impact of format and content of visual display data on comprehension, choice and preference," the researchers found that the nature of data processing in humans is less dependent on the type of information

displayed and more dependent on how it is displayed. They found that tables and pictographs are better understood than bar charts despite the latter usually being more preferred, and that numerical tables are more effective than graphs overall. Having more visual elements in a display, such as icons, makes the graphic more user-friendly than numbers but could lead to inaccurate inferences and understanding (Hildon, 2012).

In 2013, Agostinelli et al. conducted an experimental study testing the effects of different presentations on data interpretation for hospital ward reports involving 105 medical doctors and healthcare professionals from five Italian hospitals. The participants were shown 4 different data display formats created from the same data set of a hospital ward and asked to give their opinions on readability, familiarity, pleasantness, and level of understanding. More than 84% of the subjects said tables are easiest to interpret, most suitable for the data, and more pleasant to look at than the other formats. The radar format had the lowest rating in nearly every category. The researchers concluded that the choice of a graphical format influences the understanding of data and that misinterpretation of a format could have an impact on health decision making (Agostinelli, 2013).

The clarity of tables is further substantiated by a 2012 study by Dolan, Qian, and Veazie that surveyed 279 members of an online survey panel and asked them to evaluate five different data presentation formats: table, bar chart, risk scale, frequency design, and icon array. Participants' judgements when using tables, flow charts, and icon arrays were all significantly more accurate and consistent than when they used risk scales and bar charts, and the most clearly perceived format was the table (Dolan, 2012). Despite the

table format consistently ranking highly among multiple studies evaluating different data displays, the actual interfaces used on fitness activity trackers tend to be more visual.

In a 2015 study by Grierson, Corney, and Hatcher, 16 university students were asked to search for trends among data sets and given access to visualization software. The researchers found that visualization methods enabled users to achieve similar accuracy for data mining in less time when compared to traditional text-based searching. This is because visual environments make data mining more intuitive, and users prefer a more visual experience (Grierson, 2015). In a similar study by Garcia-Retamero and Hoffrage in 2013, they found that visual aids improve accuracy of data interpretation (Garcia-Retamero, 2013). A study by Chapman in 2014 about the power of imagery also found that visuals are more motivating than text for changing behavior, and a 2008 study by Ratwani about thinking graphically found that graphics reduce the number of processing cycles individuals go through to answer questions based on displays (Chapman, 2014; Ratwani, 2008).

In terms of ideal characteristics for data displays, a 2013 study conducted by Braseth and Oritsland found that it is best to adhere to simplistic designs and avoid adding unnecessary graphics in order to reduce visual complexity. Display graphs should be information-rich, and visual saliency should match data importance. Color can aid understanding because the extensive use of grey scale and dull colors can cause readability problems. The researchers concluded that an effective display should provide a concise characterization of a situation as a whole that can be recognized quickly at a glance (Braseth, 2013). Another research study by Padilla et al. in 2015 about the

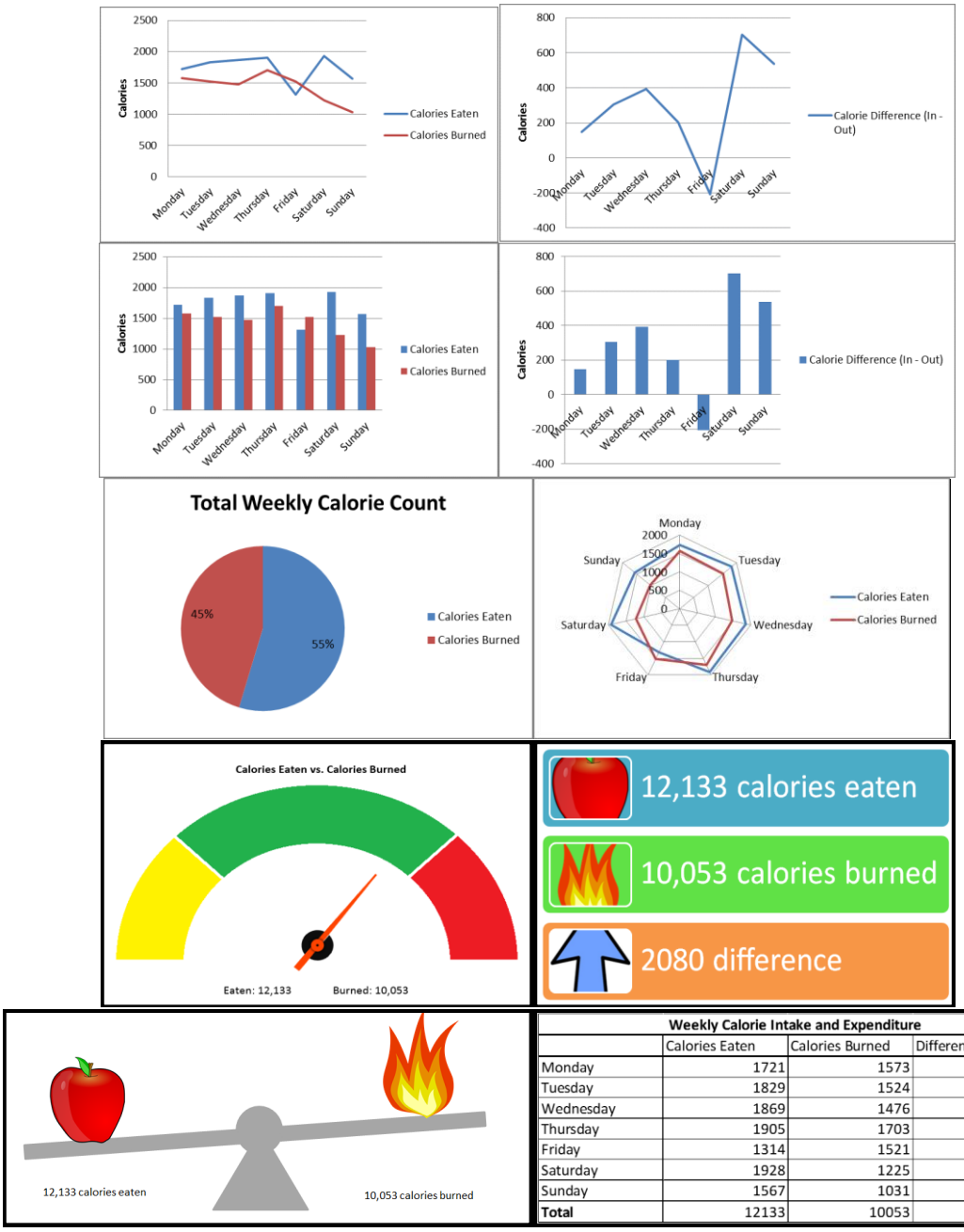
influence of different graphical displays on non-expert decision making found that people are more likely to choose display formats that have less perceived uncertainty, which usually involves more information about the data itself (Padilla, 2015).

Given the findings in prior research that support the idea of different data display formats possessing varying levels of influence upon people, I seek to apply this to fitness specifically. Can some types of data displays be more effective at promoting a healthier lifestyle than others? My research will test the following hypothesis: the format in which data is displayed can influence people's perception of its value, including their interpretation and understanding of the data, how useful or motivating they find the display to be, and their personal reaction to what is shown. This hypothesis will be applied in the context of personal fitness and health-related behaviors.

Chapter 2: Methods and Procedures

Research Design

To test the hypothesis, which states that the way in which data is displayed influences understanding of the information and the perception of its value, I generated 10 different data displays from the same data set showing weekly calorie intake versus expenditure. It is important to emphasize that only one data set was used so that differences in data interpretation can be measured; if multiple data sets were used, the displays would not be consistent. I created the data set by using the RANDBETWEEN (lower bound, upper bound) function in Microsoft Excel to generate random values for calorie intake and expenditure every day for a week. The lower and upper bounds of the sample data were specified as 1,000 and 2,000 calories, respectively. The data displays consist of different types of charts and graphs, including standard options found in Excel and also visual formats modeled after actual interfaces used by fitness activity trackers such as the Fitbit Flex, Fitbit Charge, and Apple Smartwatch. The exact displays I created are shown in Figure 2 on the following page.



Weekly Calorie Intake and Expenditure			
	Calories Eaten	Calories Burned	Difference (In - Out)
Monday	1721	1573	148
Tuesday	1829	1524	305
Wednesday	1869	1476	393
Thursday	1905	1703	202
Friday	1314	1521	-207
Saturday	1928	1225	703
Sunday	1567	1031	536
Total	12133	10053	2080

Figure 2: *Data displays used in the survey, from top to bottom (all showing calorie intake vs expenditure): line graphs, bar graphs, pie chart and radar graph, visual display (speedometer) and visual display (list), visual display (seesaw) and table.*

I created an 81 question survey using OSU Qualtrics. Participation in the survey was entirely voluntary and respondents could exit the survey at any time or skip any questions without penalty. The questions consisted of a mix between timed accuracy tests, personal perceptions of informational and motivational value, and preference rankings. For the timed accuracy tests, respondents were asked to view a page with no other content aside from a display and told to advance the page when they were ready. There was no time limit to how long they could stay on the page. When they were ready to move on and advance the page, the following page asked "Based on the data from the previous [type of display], which day of the week was the amount of calories burned more than the amount of calories eaten?" The timed accuracy test was used to test a line graph against a table showing the exact same data set and followed with the exact same follow-up question, to see if people interpreted the displays differently and how much they understood what was being shown. Other questions concerning data interpretation and perceived motivational power included:

- "The following graph represents the calorie consumption and expenditure for a person over a 1 week period. On a scale of 0 (not at all consistent) to 10 (very consistent), how consistent would you say this person is in balancing the amount of calories they've eaten vs the amount of calories they've burned?"
- "Please rate the 3 displays based on their ability to motivate you to eat healthier or exercise more, from 0 (not at all motivating) to 10 (very motivating)."

Respondents were also asked to evaluate themselves according to the Need for Cognition Scale (NFC), which is a personality variable reflecting the extent to which individuals are inclined towards effortful cognitive activities. In other words, it is an assessment instrument that quantitatively measures the tendency for an individual to engage in and enjoy thinking. Respondents are asked to indicate the extent to which a statement is characteristic of them, from 1 (extremely uncharacteristic of me) to 5 (extremely characteristic of me). Sample statements included:

- "I prefer complex to simple problems"
- "I like to have the responsibility of handling a situation that requires a lot of thinking"
- "Thinking is not my idea of fun" (reverse scored)

At the end of the survey, there were optional questions about sex, age, and weight. I explicitly specified that these questions were optional and that respondents were not required to answer these questions to advance and complete the survey. The answers given by the respondents who voluntary answered these questions were then used to calculate their BMI (body mass index).

I also conducted a small, one-week long qualitative study in which four participants were give Fitbit Flexes and asked to send daily updates of their usage. The updates consisted of just their feedback, impressions, and general thoughts about the device. At the start of the study, I met with each of participants in person to give them the Fitbit and observe the setup process. As a qualitative study, no quantitative data was recorded throughout the duration of the study. The purpose of this additional short study

was to see how people unfamiliar with fitness activity trackers responded to a Fitbit and its display interfaces. The four participants consisted of two undergraduate students and two staff members. I reached out to the staff members directly to see if they were interested in participating. To recruit the students, I posted on my personal social media asking for respondents. All of the participants voluntarily contributed to the study. They sent me their daily updates via email.

Participant Sample

The survey had 273 total respondents who started and completed the survey. To solicit participation for the survey, my advisor Curt emailed the professors of undergraduate courses at Fisher throughout December 2015 asking them to send the survey link to their students. 133 students completed the survey via this method.

In January 2016, I created a HIT request on Amazon's Mechanical Turk and received 140 responses. Approximately 90% of Mechanical Turk workers in 2015 reported that they possess degrees in higher education. Of those that have degrees, the majority of them declared business as their field of study (Brissey, 2015). Figures 3 and 4 on the following page show the education distribution of workers on Mechanical Turk.

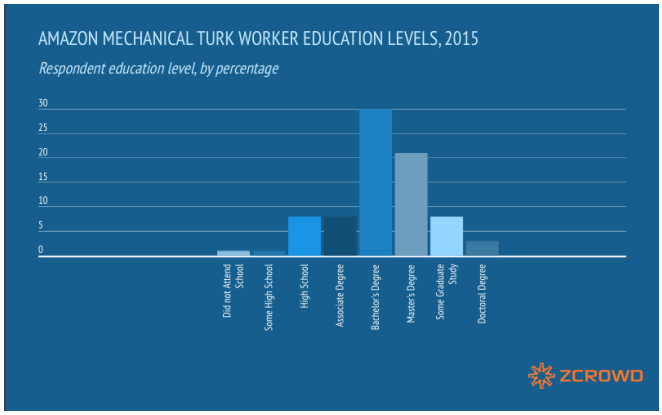


***Figure 3**: Self-reported educational levels of Mechanical Turk workers in 2015.*

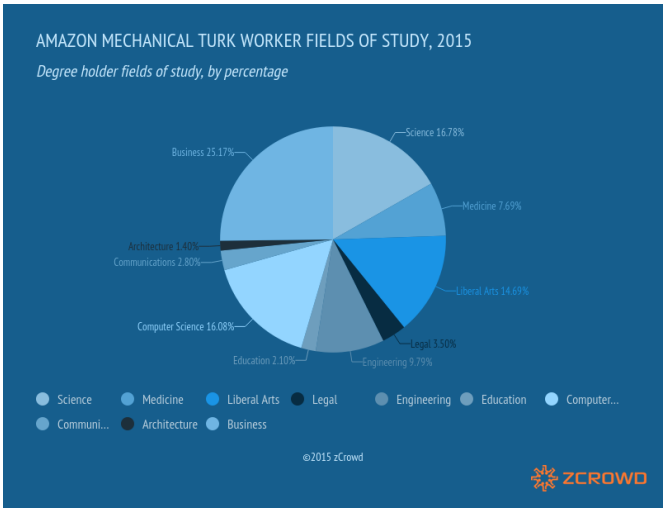


***Figure 4**: Self-reported fields of study of Mechanical Turk workers in 2015.*

Out of those who chose to answer the bio-demographic questions in the survey, the average age of the aggregate participant pool is 31, with a min of 18 and max of 72. The distribution of males versus females is approximately equal, with 134 males and 122 females. The average height of the respondents is 5’5” with a min of 4’7” and max of 6’5”, and the average weight is 165 pounds with a min of 100 and max of 319. The average BMI of the respondents is 26.84, with a min of 17.16 and a max of 49.59.

For the qualitative study, the participants consisted of two undergraduate students and two staff members. The first student is 22, female, majoring in microbiology and environmental science, and self-described as "not tech-savvy." The second student is 21, male, majoring in computer science and engineering, and self-described as "tech-savvy." Both of the staff members work in the Fisher College of Business; the first staff member is in his late 20s and self-described as "tech-savvy" whereas the second is in her late 30s and self-described as "not at all tech-savvy." For both the students and the staff members, the two individuals in each group were counterparts to each other in terms of being proficient with technology. The purpose to having counterparts is to see if there is a difference in how the individuals react to their Fitbits given their self-professed level of technology proficiency. Table 1 below lists the details for each participant.

	Undergraduate Student	Staff Member
Not tech-savvy	Female, 22, Microbiology and Environmental Science	Female, 30s, Fisher College of Business
Tech-savvy	Male, 21, Computer Science and Engineering	Male, 20s, Fisher College of Business

***Table 1**: Participant details for the qualitative Fitbit study.*

Instrumentation and Measurement

The Qualtrics survey platform was used to create and house the survey. The survey predominantly used sliders for respondents to rate the different displays (usually on a scale from 0 to 10 with accuracy to the tenths places), but also included multiple choice questions, check-boxes, and comment sections. The different displays were

imported as pictures and either placed on the same page as the rating questions or preceding questions (as was the case for the timed accuracy tests). Most of the respondents' answers were measured numerically using the slider scale, but also qualitatively for the classification and selection questions.

For the qualitative study, I asked each of the participants to email me daily updates of their thoughts about the device. I did not ask them specific questions because I wanted to get their natural reactions to their new device. Whatever they sent me was whatever they wanted or was willing to contribute. In the initial setup process when I first gave them their Fitbits, I asked them to disregard my presence and just set up their Fitbit as though I was not there. This study involved pure observation and personal feedback, no quantitative data. I then compiled the daily updates by person and identified interesting observations and feedback.

Data Analysis

Once the data from the respondents was collected for the survey, it was exported from the Qualtrics platform into a CSV (Comma Separated Values) file for analysis in Microsoft Excel. The individual ratings for different display formats, in terms of their perceived informative, motivational, and preferred value, were averaged across all respondents. These individual ratings mainly composed the questions involving sliders. For the multiple choice questions, the number of selections per answer choice was counted. For example, in the timed accuracy questions involving the table and line graph I counted the number of "correct" responses (the number of people who picked the right

choice) and the number of "incorrect" responses (the number of people who picked the other choices). The survey was also set to record the amount of time respondents spent on the page for the timed accuracy questions involving the table and line graph, which timed in seconds how long each individual spent looking at each display before advancing to the next page (there was no time limit for how long they could stay on each page). In order to determine whether or not the differences in ratings between the data display types were actually statistically significant or just due to randomness, I ran multiple t-Tests in Microsoft Excel assuming unequal variance.

To score the answers for the Need for Cognition scale, I scored each respondent's individual choices to create a numerical sum for each person. A higher total score in Need for Cognition indicates a greater need for cognition for the individual. Only those who answered every question for the scale were summed. For example, if a respondent answered only half of the questions for Need for Cognition, I did not include his score in the analysis because it was incomplete. Both the bottom 25% and the top 25% of scores for Need for Cognition were sectioned out for analysis.

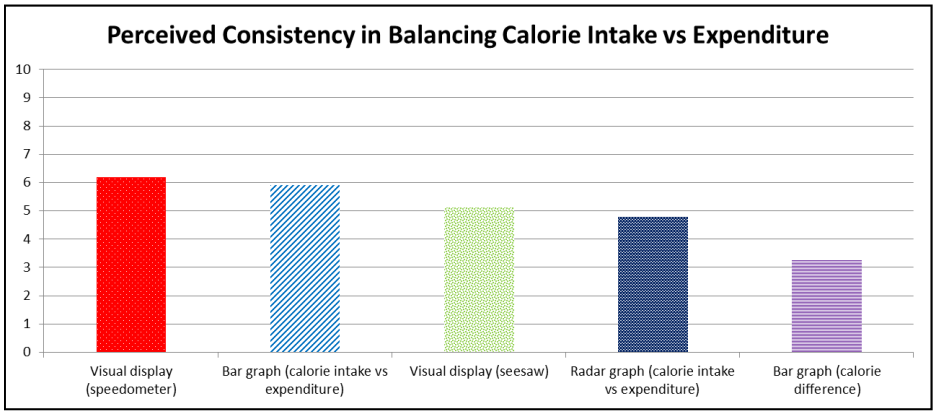
Those who voluntary chose to input their height and weight, in inches and pounds respectively, were used to calculate BMI. The average, max, and min BMI values among all the respondents were also calculated. The average, max, and min ages of the respondents was calculated for those who voluntary specified it. The number of respondents per gender was counted. This was all done to get a better idea of who was taking the survey in aggregate form, not to individually identify the respondents.

For the qualitative study, I looked over my notes from observing each participant setting up their Fitbit as well as the daily updates they sent me and extracted interesting feedback or trends that I observed.

Chapter 3: Results

Display Ratings

The following figures show how respondents perceived each of the displays. Some of the survey questions asked them to imagine that the data represented their personal fitness progress, whereas other questions told them the data was about an unspecified person. Nevertheless, all of the displays were generated from the same data set using the process previously mentioned.

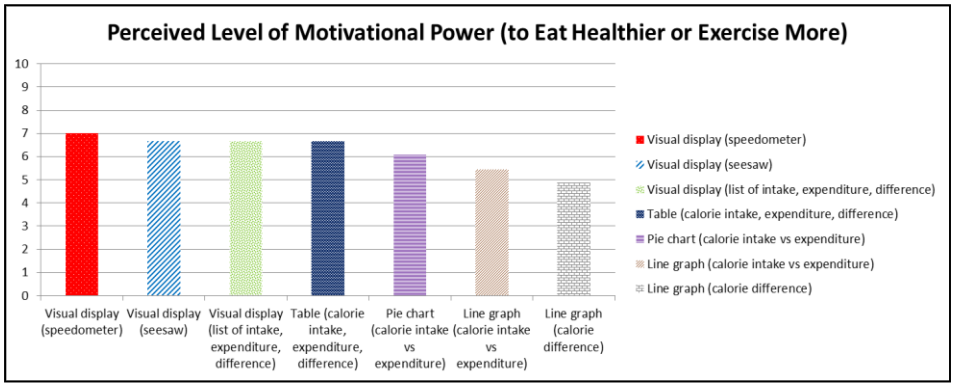


Consistency in balancing calories	
Visual display (speedometer)	6.1743
Bar graph (calorie intake vs expenditure)	5.9056
Visual display (seesaw)	5.1142
Radar graph (calorie intake vs expenditure)	4.7752
Bar graph (calorie difference)	3.2504

Figure 5*: Perceived consistency in balancing calories.*

Figure 5 shows an average of the ratings respondents gave for each data display when asked how consistent the person whose data is shown was in balancing calorie

intake versus expenditure over a one week period. The respondents were asked to rate each display on a scale of 0 (not at all consistent) to 10 (very consistent), and their ratings were averaged. A higher average rating signifies that the respondents interpreted the calories to be more consistently balanced in the display. For example, when they viewed the visual display resembling a speedometer they said that the person did a better job of balancing calories eaten and calories burned (6.1743) as opposed to when they viewed the bar graph with columns showing calorie intake and expenditure graphed side-by-side for every day of the week (5.9056). They believed that the person was least consistent in balancing calories when shown the bar graph with only one column per day showing that day's calorie difference (3.2504).

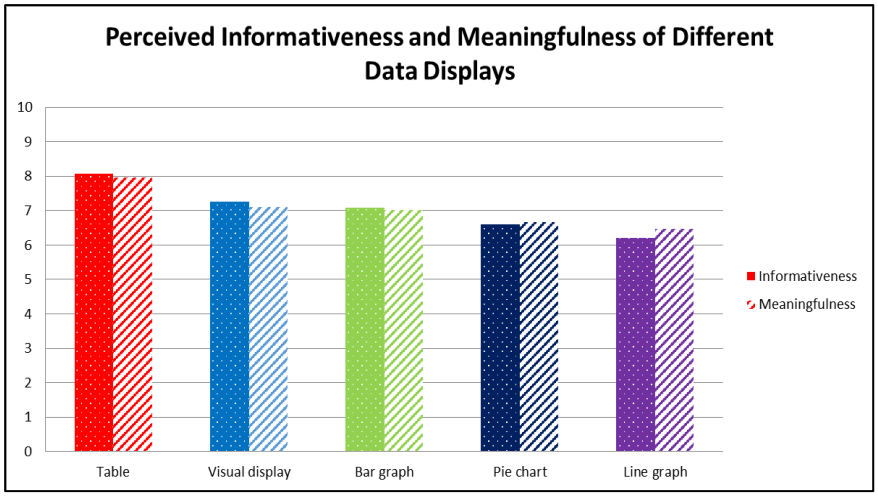


Perceived level of motivation	
Visual display (speedometer)	6.9981
Visual display (seesaw)	6.6731
Visual display (list of intake, expenditure, difference)	6.6726
Table (calorie intake, expenditure, difference)	6.6504
Pie chart (calorie intake vs expenditure)	6.0864
Line graph (calorie intake vs expenditure)	5.4303
Line graph (calorie difference)	4.8835

***Figure 6**: Perceived level of motivational power.*

Figure 6 averages the ratings of the respondents when asked to evaluate how motivational each data display was in getting them to eat healthier or exercise more. They were asked to imagine that they were trying to lose weight, shown a display, and then asked how motivational the display was on a scale from 0 (not at all motivating) to 10 (very motivating). A higher average rating signifies that the respondents found the display to have more motivational power. For example, they found the visual display resembling a speedometer to be the most motivating (6.9981) in terms of getting them to eat healthier or exercise more if they had the goal to lose weight. Interestingly, all three visual displays received the highest average ratings for motivational power whereas both types of line graphs received the lowest ratings. The table received a relatively high

rating as well (6.6504). It should be noted that Figure 5 shows that people perceived the speedometer display to have been the most consistent in balancing calories, yet Figure 6 shows that people also believed it to have the highest motivational power. This is interesting because one would assume that a higher consistency means a better job of keeping to the stated fitness goal of balancing calories, yet respondents found visual displays to be the most motivating in adopting more healthy habits.

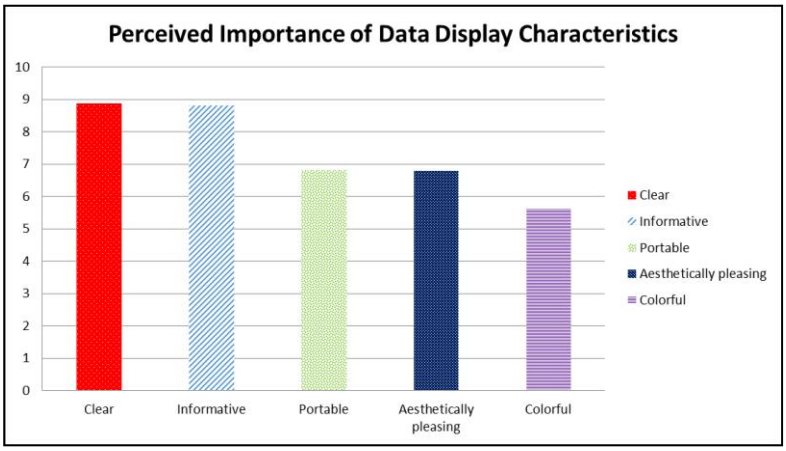


Data display ranking	Informativeness	Meaningfulness
Table	8.0784	7.9519
Visual display	7.2672	7.1036
Bar graph	7.0800	7.0179
Pie chart	6.6012	6.6763
Line graph	6.2084	6.4738

***Figure 7**: Perceived informativeness and meaningfulness.*

Figure 7 shows the average ratings for perceived informativeness and meaningfulness for the different types of data displays. Respondents were asked in two separate questions to rate how informative and meaningful they found each display to be,

from 0 (not at all informative/meaningful) to 10 (very informative/meaningful). As shown, the table display type received the highest average rating and is perceived to be both the most informative (8.0784) and the most meaningful (7.9519) followed by visual display. Line graphs, which previously received the lowest ratings for motivational power, also received the lowest averages for both informativeness (6.2084) and meaningfulness (6.4738). Bar graphs, which previously ranked relatively highly in consistency, ranked in the middle.



Perceived importance of characteristics	
Clear	8.8726
Informative	8.8004
Portable	6.8161
Aesthetically pleasing	6.7907
Colorful	5.6212

***Figure 8**: Perceived importance of display characteristics.*

Figure 8 shows the average ratings for what respondents find most important in a display. They were asked to rate how important they find each characteristic to be in a

data display from 0 (not at all important) to 10 (very important). As shown, respondents rated clarity (8.8726) and informativeness (8.8004) most highly. Characteristics related to the appearance of a display, such as whether or not it is aesthetically pleasing (6.7907) and colorful (5.6212), were rated least important. In general, characteristics about the content of a display (clarity and informativeness) were rated higher than characteristics pertaining to its appearance (aesthetics and color). Portability ranked in the middle (6.8161) but has a rating closer to the two lower-ranked, appearance-related characteristics.

Statistical Significance

t-Test: Two-Sample Assuming Unequal Variances		
Visual (Speedometer) vs Bar Graph (Calorie Intake vs Expenditure)		
	Variable 1	*Variable 2*
Mean	6.1743494	5.9055762
Variance	4.5128844	4.3894091
Observations	269	269
Hypothesized Mean Difference	0	
df	536	
t Stat	1.4774446	
P(T<=t) one-tail	0.0700719	
t Critical one-tail	1.6477014	
P(T<=t) two-tail	0.1401438	
t Critical two-tail	1.9643997	

t-Test: Two-Sample Assuming Unequal Variances		
Visual (Speedometer) vs Bar Graph (Calorie Difference)		
	Variable 1	*Variable 2*
Mean	6.174349	3.250390625
Variance	4.512884	3.641490043
Observations	269	256
Hypothesized Mean Difference	0	
df	521	
t Stat	16.60668	
P(T<=t) one-tail	2.56E-50	
t Critical one-tail	1.647784	
P(T<=t) two-tail	5.12E-50	
t Critical two-tail	1.964528	

t-Test: Two-Sample Assuming Unequal Variances		
Bar Graph (Calorie Intake vs Expenditure) vs Bar Graph (Difference)		
	Variable 1	*Variable 2*
Mean	5.9055762	3.2503906
Variance	4.3894091	3.64149
Observations	269	256
Hypothesized Mean Difference	0	
df	522	
t Stat	15.193072	
P(T<=t) one-tail	9.793E-44	
t Critical one-tail	1.6477779	
P(T<=t) two-tail	1.959E-43	
t Critical two-tail	1.9645189	

t-Test: Two-Sample Assuming Unequal Variances		
Visual (Speedometer) vs Visual (Seesaw)		
	Variable 1	*Variable 2*
Mean	6.174349	5.114176245
Variance	4.512884	4.3937598
Observations	269	261
Hypothesized Mean Difference	0	
df	528	
t Stat	5.782785	
P(T<=t) one-tail	6.29E-09	
t Critical one-tail	1.647745	
P(T<=t) two-tail	1.26E-08	
t Critical two-tail	1.964467	

***Table 2**: Statistical significance (t-Tests) for perceived consistency in balancing calories.*

As shown in table 2, in order to test whether or not the differences in perceived consistency for balancing calories between the different data displays is statistically significant or just due to randomness, I ran several t-Tests with an alpha value of 0.05 (95% confidence interval) for two samples assuming unequal variances to match the displays with each other. The null hypothesis is that "there is no difference in perceived consistency between the different display formats" whereas the alternate hypothesis is that "there is a statistically significant difference between the displays." The general rule for t-Tests is that if the t Stat larger than the t Critical value, then the null hypothesis can be rejected and the results are statistically significant.

As shown, the difference between the two highest-rated displays formats, the visual speedometer display and the bar graph comparing calorie intake versus expenditure, is not statistically significant because t Stat (1.4774) is not larger than t Critical (1.6477). The perceived consistency between the highest-rated display and the lowest-rated display, the visual speedometer and the bar graph showing just calorie difference, is statistically significant because t Stat (16.6067) is greater than t Critical (1.6478). There is also a meaningful difference between the two bar graph formats when compared to each other (t Stat of 15.1931 vs t Critical of 1.6478); likewise the two visual display formats also possess statistically significant differences when compared to each other in perceived consistency (t Stat of 5.7828 vs t Critical of 1.6477). In any case where the comparison is statistically significant, the null hypothesis (that there is no difference between the different display formats) is rejected.

t-Test: Two-Sample Assuming Unequal Variances Visual Display (Speedometer) vs Line Graph (Calorie Difference)		
	Variable 1	*Variable 2*
Mean	6.998141264	4.8835249
Variance	5.791302502	5.87022753
Observations	269	261
Hypothesized Mean Difference	0	
df	527	
t Stat	10.07871338	
P(T<=t) one-tail	2.88682E-22	
t Critical one-tail	1.64775015	
P(T<=t) two-tail	5.77364E-22	
t Critical two-tail	1.964475628	

t-Test: Two-Sample Assuming Unequal Variances Visual Display (List) vs Table		
	Variable 1	*Variable 2*
Mean	6.672556	6.65037594
Variance	5.690301	4.456471556
Observations	266	266
Hypothesized Mean Difference	0	
df	522	
t Stat	0.113566	
P(T<=t) one-tail	0.454813	
t Critical one-tail	1.647778	
P(T<=t) two-tail	0.909626	
t Critical two-tail	1.964519	

t-Test: Two-Sample Assuming Unequal Variances Visual Display (Speedometer) vs Table		
	Variable 1	*Variable 2*
Mean	6.998141264	6.65037594
Variance	5.791302502	4.45647156
Observations	269	266
Hypothesized Mean Difference	0	
df	526	
t Stat	1.777400238	
P(T<=t) one-tail	0.038040075	
t Critical one-tail	1.647755666	
P(T<=t) two-tail	0.07608015	
t Critical two-tail	1.964484225	

t-Test: Two-Sample Assuming Unequal Variances Table vs Pie Chart (Calorie Intake vs Expenditure)		
	Variable 1	*Variable 2*
Mean	6.650376	6.086415094
Variance	4.456472	4.657996569
Observations	266	265
Hypothesized Mean Difference	0	
df	529	
t Stat	3.043727	
P(T<=t) one-tail	0.001226	
t Critical one-tail	1.647739	
P(T<=t) two-tail	0.002453	
t Critical two-tail	1.964459	

t-Test: Two-Sample Assuming Unequal Variances Pie Chart vs Line Graph (Calorie Intake vs Expenditure)		
	Variable 1	*Variable 2*
Mean	6.086415094	5.4302682
Variance	4.657996569	4.86211877
Observations	265	261
Hypothesized Mean Difference	0	
df	523	
t Stat	3.448338463	
P(T<=t) one-tail	0.000304763	
t Critical one-tail	1.647772343	
P(T<=t) two-tail	0.000609525	
t Critical two-tail	1.964510213	

t-Test: Two-Sample Assuming Unequal Variances Line Graph (Calorie Intake vs Expenditure) vs Line Graph (Calorie Difference)		
	Variable 1	*Variable 2*
Mean	5.430268	4.883524904
Variance	4.862119	5.870227527
Observations	261	261
Hypothesized Mean Difference	0	
df	515	
t Stat	2.696227	
P(T<=t) one-tail	0.003621	
t Critical one-tail	1.647818	
P(T<=t) two-tail	0.007243	
t Critical two-tail	1.964581	

***Table 3**: Statistical significance (t-Tests) for perceived level of motivational power.*

As shown in table 3, in testing statistical significance for differences in the perceived level of motivational power for each data display format I found that the difference between the highest-rated display of the visual speedometer and the lowest-rated display of the line graph showing calorie difference is indeed meaningfully significant (t Stat of 10.0787 vs t Critical of 1.6478). The difference between the highest-

rated visual display and the table is statistically significant (t Stat of 1.7774 vs t Critical of 1.6478), but the difference between the lowest-rated visual display and the table is not (t Stat of 0.1136 vs t Critical of 1.6478). There is a meaningful difference between the table and the pie chart (t Stat of 3.0437 vs t Critical of 1.6477) and also between the pie chart and the higher-rated line graph (t Stat of 3.4483 vs t Critical of 1.6478). Although both of the line graphs ranked lowest for their perceived level of motivational power, the difference between them is actually statistically significant (t Stat of 2.6962 and t Critical of 1.6478).

t-Test: Two-Sample Assuming Unequal Variances Table vs Visual Display		
	Variable 1	*Variable 2*
Mean	8.078378	7.2671937
Variance	3.844492	3.5853084
Observations	259	253
Hypothesized Mean Difference	0	
df	510	
t Stat	4.762227	
P(T<=t) one-tail	1.25E-06	
t Critical one-tail	1.647847	
P(T<=t) two-tail	2.5E-06	
t Critical two-tail	1.964626	

t-Test: Two-Sample Assuming Unequal Variances Visual Display vs Bar Graph		
	Variable 1	*Variable 2*
Mean	7.267193676	7.08
Variance	3.585308363	2.5457008
Observations	253	255
Hypothesized Mean Difference	0	
df	491	
t Stat	1.204463845	
P(T<=t) one-tail	0.114495307	
t Critical one-tail	1.647962926	
P(T<=t) two-tail	0.228990615	
t Critical two-tail	1.964807223	

t-Test: Two-Sample Assuming Unequal Variances Bar Graph vs Pie Chart		
	Variable 1	*Variable 2*
Mean	7.08	6.6011719
Variance	2.545701	5.4479594
Observations	255	256
Hypothesized Mean Difference	0	
df	451	
t Stat	2.708044	
P(T<=t) one-tail	0.003513	
t Critical one-tail	1.648239	
P(T<=t) two-tail	0.007025	
t Critical two-tail	1.965238	

t-Test: Two-Sample Assuming Unequal Variances Pie Chart vs Line Graph		
	Variable 1	*Variable 2*
Mean	6.601171875	6.2084291
Variance	5.447959406	4.4473133
Observations	256	261
Hypothesized Mean Difference	0	
df	508	
t Stat	2.006282106	
P(T<=t) one-tail	0.022677862	
t Critical one-tail	1.647858683	
P(T<=t) two-tail	0.045355725	
t Critical two-tail	1.964644767	

***Table 4**: Statistical significance (t-Tests) for perceived level of informativeness.*

As shown in table 4, in analyzing the statistical significance of respondents' answers to how informative they consider each type of data display format to be I found that every display format is meaningfully different from the one following it in ranking except for the visual display and bar graph (t Stat of 1.2045 vs t Critical of 1.6480). Thus, the ratings for the table versus visual display, bar graph versus pie chart, and pie chart versus line graph are all statistically significant.

t-Test: Two-Sample Assuming Unequal Variances Table vs Visual Display		
	Variable 1	*Variable 2*
Mean	7.951938	7.1035714
Variance	3.696202	3.5747681
Observations	258	252
Hypothesized Mean Difference	0	
df	508	
t Stat	5.024236	
P(T<=t) one-tail	3.51E-07	
t Critical one-tail	1.647859	
P(T<=t) two-tail	7.01E-07	
t Critical two-tail	1.964645	

t-Test: Two-Sample Assuming Unequal Variances Visual Display vs Bar Chart		
	Variable 1	*Variable 2*
Mean	7.103571429	7.017899
Variance	3.574768071	2.519757
Observations	252	257
Hypothesized Mean Difference	0	
df	489	
t Stat	0.553128466	
P(T<=t) one-tail	0.290214113	
t Critical one-tail	1.647975667	
P(T<=t) two-tail	0.580428226	
t Critical two-tail	1.96482708	

t-Test: Two-Sample Assuming Unequal Variances Bar Chart vs Pie Chart		
	Variable 1	*Variable 2*
Mean	7.017899	6.6762646
Variance	2.519757	4.8899422
Observations	257	257
Hypothesized Mean Difference	0	
df	464	
t Stat	2.011999	
P(T<=t) one-tail	0.022399	
t Critical one-tail	1.648144	
P(T<=t) two-tail	0.044798	
t Critical two-tail	1.96509	

t-Test: Two-Sample Assuming Unequal Variances Pie Chart vs Line Graph		
	Variable 1	*Variable 2*
Mean	6.676264591	6.473846
Variance	4.889942242	4.316765
Observations	257	260
Hypothesized Mean Difference	0	
df	512	
t Stat	1.072364504	
P(T<=t) one-tail	0.142030765	
t Critical one-tail	1.647835164	
P(T<=t) two-tail	0.28406153	
t Critical two-tail	1.964608113	

***Table 5**: Statistical significance (t-Tests) for perceived level of meaningfulness.*

As shown in table 5, the ratings for the perceived meaningfulness of a table compared to a visual display, which were the first and second-highest rated, are statistically significant (t Stat of 5.0242 vs t Critical of 1.6479). The ratings for a bar chart compared to a pie chart are also meaningfully different (t Stat of 2.0120 vs t Critical of 1.6481). A visual display compared to a bar chart is not meaningfully significant (t Stat of 0.5531 vs t Critical of 1.6480), and neither is a pie chart compared to a line graph (t Stat of 1.0724 vs t Critical of 1.6478).

t-Test: Two-Sample Assuming Unequal Variances Clear vs Informative		
	Variable 1	*Variable 2*
Mean	8.87258687	8.800386
Variance	1.77478824	1.582752
Observations	259	259
Hypothesized Mean Difference	0	
df	514	
t Stat	0.63413413	
P(T<=t) one-tail	0.2631377	
t Critical one-tail	1.64782354	
P(T<=t) two-tail	0.5262754	
t Critical two-tail	1.96459	

t-Test: Two-Sample Assuming Unequal Variances Informative vs Portable		
	Variable 1	*Variable 2*
Mean	8.8003861	6.816078
Variance	1.58275179	5.348284
Observations	259	255
Hypothesized Mean Difference	0	
df	391	
t Stat	12.0572208	
P(T<=t) one-tail	5.5503E-29	
t Critical one-tail	1.64876004	
P(T<=t) two-tail	1.1101E-28	
t Critical two-tail	1.96604968	

t-Test: Two-Sample Assuming Unequal Variances Portable vs Aesthetically Pleasing		
	Variable 1	*Variable 2*
Mean	6.81607843	6.790698
Variance	5.34828377	5.622481
Observations	255	258
Hypothesized Mean Difference	0	
df	511	
t Stat	0.12273095	
P(T<=t) one-tail	0.4511842	
t Critical one-tail	1.64784101	
P(T<=t) two-tail	0.9023684	
t Critical two-tail	1.96461722	

t-Test: Two-Sample Assuming Unequal Variances Aesthetically Pleasing vs Colorful		
	Variable 1	*Variable 2*
Mean	6.79069767	5.621176
Variance	5.62248122	7.931046
Observations	258	255
Hypothesized Mean Difference	0	
df	495	
t Stat	5.08512938	
P(T<=t) one-tail	2.6105E-07	
t Critical one-tail	1.64793775	
P(T<=t) two-tail	5.221E-07	
t Critical two-tail	1.96476799	

***Table 6**: Statistical significance (t-Tests) for perceived importance of display characteristics.*

As shown in table 6, the difference between ratings for clarity and informativeness, the two top-rated characteristics, is not statistically significant (t Stat of 0.6341 vs t Critical of 1.6478). Neither is the difference between portability and pleasing aesthetics (t Stat of 0.1227 vs t Critical of 1.6478). The difference between informativeness and portability is more pronounced, however, and statistically significant

(t Stat of 12.0572 vs t Critical of 1.6488). Ratings for an aesthetically pleasing appearance and colorfulness are also meaningfully different (t Stat of 5.0851 vs t Critical of 1.6479).

Need for Cognition

Need for Cognition (Bottom 25%)			Need for Cognition (Top 25%)		
	Line graph	Table	Top 25%	Line graph	Table
Count of accurate	29	42	Count of accurate	36	49
Count of inaccurate	27	14	Count of inaccurate	20	7
Average time spent (in seconds)	106.89	45.01	Average time spent (in seconds)	49.67	27.34
Total count of responses	56	56	Total count of responses	56	56
% Accurate responses	52%	75%	% Accurate responses	64%	88%
Average Need for Cognition	44.73		Average Need for Cognition	78.25	
Min Need for Cognition	18		Min Need for Cognition	72	
Max Need for Cognition	54		Max Need for Cognition	90	

***Table 7**: Accuracy rate by Need for Cognition.*

Table 7 shows the results of the timed accuracy tests, juxtaposing the line graph and table, broken up by Need for Cognition. I first determined the respondents with the lowest total scores for Need for Cognition (those who ranked in the bottom 25%) and the highest (those who ranked in the top 25%). I then counted how many of them answered the accuracy questions correctly as well as the average amount of time they spent looking at each display. Respondents who ranked in the bottom 25% for Need for Cognition spent an average of 106.89 seconds looking at the line graph before advancing to the next page, and 52% of these same people correctly answered the subsequent question about the information shown in the display. For the table, they spent an average of 45.01 seconds

looking at the display before advancing the page and 75% answered the question correctly. In contrast, those who ranked in the top 25% for Need for Cognition spent an average of 49.67 seconds looking at the line graph with a 64% accuracy rate, and 27.34 seconds looking at the table with an 88% accuracy rate. Even though the top 25% have lower average amount of time spent and higher accuracy rates for both the line graph and table, both the bottom 25% and the top 25% consistently spent less time looking at the table than the line graph yet answered more accurately for the table.

Qualitative Study Observations and Feedback

For the qualitative study, I noticed some interesting observations as each participant was setting up their Fitbit device:

- The two participants who declared they were not tech-savvy picked up and analyzed the instruction booklet first upon opening the box, whereas the two tech-savvy participants immediately began to fiddle with the device itself
- The two non tech-savvy participants completed the setup process faster than the other two because they immediately and thoroughly followed the instructions, whereas the tech-savvy two took longer because they wanted to figure out how to set up and use the device themselves without reading the instructions but failed to do so
- All of the participants expressed confusion at what some of the accessories were that came with the Fitbit, even after they followed the setup instructions

- Once all participants finished setting up their devices, they expressed surprise at how easy it was to do so
- The non tech-savvy student and the tech-savvy staff member both said that the interface is very user-friendly and easy to understand
- The tech-savvy student said that he would have preferred to have been able to set up the device without the internet or the use of his phone, and wondered how people who do not own a smartphone would be able to do so (the setup process involves downloading an application on a smartphone)
- The non tech-savvy staff member said that although being more familiar with technology likely would have made the setup process faster, she believed that the instructions and interface were so easy to understand already that she had no problem setting it up

In regards to their general updates for the week, I extracted some interesting feedback per person about their thoughts on the device and its usage:

Non tech-savvy student:

- "The dashboard is very self-explanatory and the interface is easy to navigate"
- "The app on the phone and the online dashboard are both extremely easy to learn and understand"

- "The Fitbit continues to be a high tech reminder of my meal plan, weight goal, and overall health…though my diet is pretty good, the Fitbit has me constantly thinking of ways to better it"
- "Because I log my water intake on the Fitbit, I am more aware of how much water I am drinking, and have tried to increase my water consumption due to the extremely small amounts that I consume…I had no idea that I was drinking such a small amount until I had to physically log my water intake via the Fitbit"
- "I continue to find ways of improving my diet and overall health"

Tech-savvy student:

- "I checked it every couple of hours to see how far I walked after the app gave me a goal of steps per day"
- "It gave me a notification when I reached a certain percentage of my steps per day goal…that was encouraging"
- "I decided not to take the bus to get to my next class…instead, I walked there"
- "I check the Fitbit app multiple times in one day to get an update on my progress"
- "The Fitbit was simple to set up and incorporate into my everyday life, and I came to the conclusion that I need to change some important things in my life to help ensure my health"

Non tech-savvy staff member:

- "It's a visual accountability tool which is really nice"

- "I am now cognizant of how many steps I walk per day and try to reach my daily goal before bed"
- "The device is user-friendly and has more capabilities than I currently understand"
- "It is a reminder to me to step up my activity, especially activity that increases my heart rate"
- "It has been really fun to see my progress…I am certain that I am NOT using it to its full potential"

Tech-savvy staff member:

- "I have noticed that I am checking my progress very often as it's really interesting to see how far I got on any particular daily goal…this has definitely made me want to be more active during the day, and in fact yesterday I decided to take a walk around campus during lunch and to only use the stairs just so I could track my progress"
- "When I saw that I had not reached my goal of 10,000 steps for the day, it made me want to make up the difference the next day, and I think I honestly only wanted to go running because I had my Fitbit…I don't typically run when it's snowing and really windy"
- "I see a general trend of an increase in my daily activity compared to activity levels from previous days"

- "Now that I have multiple days that have been tracked, I find myself even more determined to be more active than the previous day…my overall physical activity has definitely increased each day"
- "I definitely see me taking full advantage of my Fitbit and trying to use all of the features that are available to improve my overall wellbeing"

Chapter 4: Discussion and Conclusion

Interpretation

Based on the numerical averages, counts, totals, and statistical analyses, I have made several conclusions in regards to how the format in which data is displayed can influence people's perception of its value.

A table is the most informative and meaningful data display format. In the timed accuracy tests, both respondents who ranked in the bottom 25% for Need for Cognition and those who ranked in the top 25% found the table easier to understand; they took less time to view the table yet answered more accurately. This goes to show that in this study the table was easier to understand regardless of how deeply people analyzed it. This aligns with Dolan's research where the table format was consistently understood more accurately among study participants (Dolan, 2012). The table was rated highest in terms of informativeness, and its average rating is statistically significant from the second-ranked format of visual display. The table was also rated highest in terms of meaningfulness, and its average rating is statistically significant from the second-ranked format of visual display. This supports Agostinelli's prior research finding that tables are the easiest to interpret and understand out of all data presentation types, as well as

Hildon's research findings that specify tables are more effective than other graphs (Agostinelli, 2013; Hildon, 2012).

Line graphs are perceived as the least informative and motivating type of display. Both types of line graphs used in the survey received the lowest scores for perceived level of motivation, which were statistically significant from its closest-ranked format, the pie chart. The difference between ratings for informativeness between line graphs and pie charts was also statistically significant. The ratings for meaningfulness between line graphs and pie charts, however, are not statistically different

How data is displayed does influence the severity of conclusions people deduce from it, even when the data itself is unchanged (such as all the displays being created from the same data set). Respondents perceived a visual data display, the speedometer, as showing more consistency in balancing calorie intake versus expenditure. The perceived level of consistency even varies between displays of the same format, as shown by the fact that the differences in ratings between the two bar graphs as well as between the two visual displays are both statistically significant. The ratings for the highest-rated visual display for perceived motivational power, the speedometer, are statistically significant from the ratings for the table; the lowest-rated visual display, the list, is not statistically significant from the table. Thus, the table is a strong display format that rivals visual displays. In terms of raw averages, all three visual displays ranked at the top for motivational power. This supports Grierson's conclusions that people prefer a more visual experience when data mining, as well as Agostinelli's research that states health decisions can be impacted by display format (Grierson, 2015; Agostinelli, 2013).

Chapman's hypothesis that visuals are more motivating than text in terms of changing personal behavior is also supported by the fact that all three visual displays possessed the highest raw data ratings (Chapman, 2014).

Respondents find content-related characteristics more important in data displays than appearance-related characteristics. In terms of raw averages, clarity and informativeness ranked at the top for perceived importance of data display characteristics and the difference between their ratings is not statistically significant. Clarity and informativeness can be attributed to characteristics related to the data or in understanding the data itself. Portability, however, is attributed to how mobile the display is and how easily it can be transferred or used among different devices. The difference in ratings between portability and informativeness, which is ranked lower than clarity, is statistically significant. The difference between portability and pleasing aesthetics, however, is not statistically significant. Aesthetically pleasing and colorful are characteristics attributed to the appearance of the display, and emphasizes how it looks rather than how easily it can be understood. Interestingly, the difference in ratings between aesthetically pleasing and colorful is meaningful. The divisions in statistical significance seem to mean that respondents find different content-related characteristics, such as clarity and informativeness, roughly equally important and more important than portability. Portability is roughly equally important as aesthetics, which is more important than how colorful a display is. This supports Braseth's research that states effective displays should be information-rich and centered on the data (Braseth, 2013). Interestingly, Braseth also finds that color is important for readability but in this study

colorfulness is ranked lowest in importance. This may be because his study contained more elements of appearance-related characteristics and so color ranked highly among these design characteristics, whereas the characteristics I used were more high-level and not as specific for each type. My results also support Padilla's study, which found that people prefer display formats associated with less uncertainty by having more information about the data itself (Padilla, 2015).

Overall, my study supports my hypothesis and aligns with prior research that states the method in which data is displayed can influence people's perception of its value. I attempted to apply this hypothesis to fitness specifically by asking questions related to motivation, understanding, and accuracy for exercise and other healthful habits. As shown in my findings, some data display formats are not statistically significant from others. In fact, some types are quite similar in terms of how easy to understand or motivating they are. These types received similar ratings and ranked closely to each other. In general, however, there is always at least a meaningful difference between the top-rated display type and the lowest-rated display type for each value-based variable. Tables and visual displays consistently ranked highest in the value-based variables I examined (informativeness, meaningfulness, motivational power). What I believe to be my most compelling finding is that both the bottom 25% and the top 25% for Need for Cognition performed better on the accuracy test when shown the table. This concludes that the table truly is easier to understand, and not just for the people who like to spend more time thinking about a problem in-depth. As mentioned by Braseth in his research,

an effective data display should present the data in a way that it can be recognized and interpreted relatively easily at a glance (Braseth, 2013).

From the feedback received in the qualitative study, it can be concluded that fitness activity trackers and devices like the Fitbit do possess a relatively significant influence in getting people to make better fitness choices. For example, all four participants wrote that they made a change to their daily routines as a result of acquiring a Fitbit. The non tech-savvy student improved her diet, and her tech-savvy counterpart took less public transportation in order to be more active. The non tech-savvy staff member tried to reach her daily step goal before bed, and her tech-savvy counterpart only went for a run in unfavorable weather in order to reach his daily step goal. These are all changes that occurred within only one week, and all the participants said they were happy to be more informed about their daily fitness and consumption habits. Both of the non tech-savvy participants expressed surprise at how user-friendly and easy-to-navigate the dashboard and interfaces were. Although their tech-savvy counterparts did not explicitly state how easy to use the device and its mobile and online applications were, likely because they are more familiar with technology in general and are able to use most of it easily already, they did mention that they tracked their individual progress multiple times throughout the day and that the device was easy to incorporate into their daily lives.

Implications

Although my study is certainly not comprehensive in terms of determining which data types are the most informative, meaningful, and motivational, these findings can

nevertheless be applied to inducing more healthful behaviors. Even if the differences in motivational power between data types is not as pronounced or statistically significant in real-life as they are in this study, if the continued use of one data display format encourages even an infinitesimal change in behavior for the better then it is worth using. Choosing to view fitness progress using a visual display (top-rated in motivational power) as opposed to a line graph (lowest-rated) would probably not induce significantly more exercise at any one time, but it may increase fitness in small amounts every day that will add up and contribute to better health. I believe this is because the better understood the data is, the more willing a person is to make a change. For example, if a person does not really understand what their current fitness progress looks like then they cannot make an informed decision for how to improve.

This research can help makers of fitness activity trackers and other health-related gadgets improve the effectiveness of their devices in getting people to reach their goals. Users of fitness activity trackers can be shown their progress in a certain format by default that has been proven to be the easiest to understand. Users of other health-related gadgets can also receive their feedback in a certain format that has more motivational power in getting them to stick to a regime, such as prescription adherence. Overall, the impact of encouraging people to make better decisions by choosing certain display formats over others to track health may be small at any one time, but I believe it can build up to a sustained improvement.

Although the additional Fitbit study is qualitative and the results cannot be truly quantified, from observations and feedback alone it can be seen that fitness activity

trackers do possess a sizable influence on fitness habits. Within a span of only one week, all four participants expressed that they were more motivated to be active every day in order to meet their specified goals. One of them also willingly changed her diet once she became aware of the types of food and the amount of water she consumed each day. With the workforce becoming increasingly sedentary and societal culture getting more fast-paced, people are relying on such devices to regulate their health habits and keep them informed about their physical activity levels and diet. The impact that owning a Fitbit had on these four individuals shows that it is important to make such devices as effective as possible, because at least in this study such devices definitely made an impact and was the main tool the participants used to keep track of their daily health. The progress they were shown each day was a significant motivator for them to be more active, eat healthier, or drink more water. With the growing adoption rate of wearables, people will increasingly begin to rely on these devices and their displays for progress feedback so it is important to continuously improve them in order to create even more positive benefits.

Limitations

There are certain limitations to this study that need to be addressed. First, the majority of the respondents to the survey is higher-educated and may not be representative of the general population. For example, even though I sectioned out the bottom 25% and top 25% of Need for Cognition scores, these scores may already be higher than average. This applies to the general ratings as well. I do not know how people with varying levels of education will interpret the displays and the questions. It may be

that those with some higher-education tend to already prefer certain display formats over others due to exposure or preconceived bias.

Second, this study would have been more effective if I were able to randomly assign different versions of the survey to respondents. Instead of having respondents answer several similar questions but with different displays, I could have one type of display assigned to a respondent and another type to a separate respondent. I could then compare the ratings for the displays at the end.

Third, I would have liked to conduct an experiment using Fitness activity trackers and testing motivational power by providing actual feedback about personal fitness progress instead of just administering a survey and asking for motivation ratings directly. I structured each question around fitness, such as asking participants to rate motivation in terms of exercising more or eating healthier, but conducting a quantifiable experiment would have resulted in more compelling and natural responses for motivational power. The qualitative study offered valuable genuine feedback about Fitbit use, but it was not quantitative and did not distinguish between different data display formats for progress; it only focused on the device and its interface as a whole.

Lastly, not every data display format is represented in the survey. For each value-based variable (informativeness, meaningfulness, motivational power), I chose displays that were representative of significant differences based on personal perception, prior research, and the actual interfaces found on fitness devices. Due to space constraints and wanting to keep the survey to a reasonable length, I could not compare all of the different types of displays to each other in every portion of the study. For example, although the

radar graph was included in testing for consistency I did not ask respondents to rate its motivational power. This is because radar graphs are not usually found on device interfaces, so I only chose displays that are popularly used for tracking fitness progress.

Opportunities for Future Research

Future research on this topic could more comprehensively test different data display formats. There are numerous variations for how data can be displayed, and the most informative or motivating format may not be one that was included in my study. To address the aforementioned limitations in my research, I believe it would be more compelling to conduct an experimental study involving quantifiable fitness data. Instead of asking respondents to rate how motivating each display is, the experiment could simply deduce it by alternating the format in which progress is shown to participants and monitoring how they react. For example, one week a participant is shown his progress in a table and the next week he is given a bar graph. The researcher would then monitor how his fitness patterns change from week to week.

I think using a more diverse population would be best as well. It would be interesting to see how different groups of people with varying backgrounds and education levels respond to the different display formats. Finally, similar research could be conducted in other medical or health-related fields to see if motivational power varies by the type of activity. For example, would the preferred display format change if the respondents were asked to ingest medicine as opposed to exercising? This would be interesting to analyze because exercise and healthy eating are seen as voluntary positive

behaviors, whereas other health-related regimes are not fully-voluntary and might even be perceived as unpleasant.

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Appendix A: Survey Questions

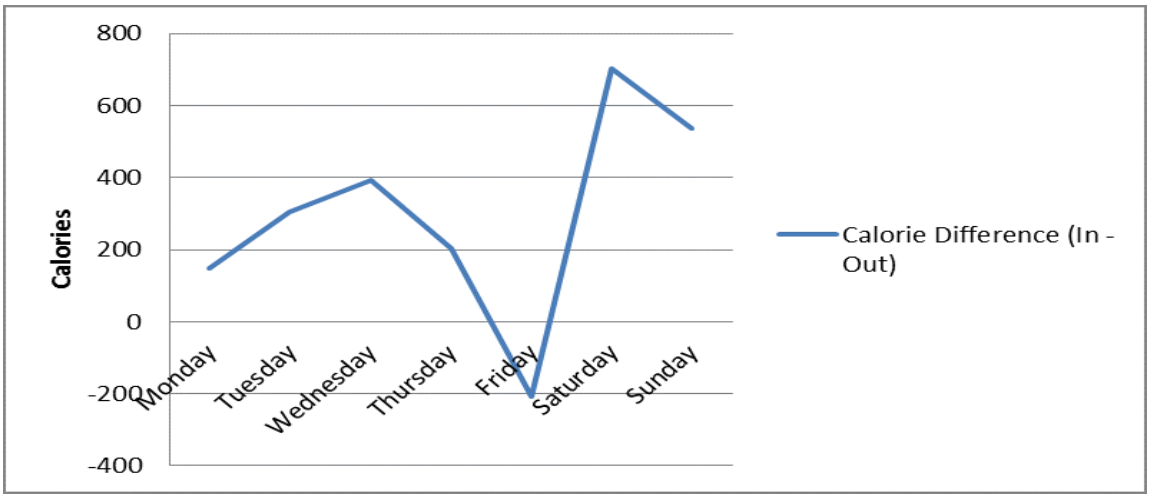
Cover page:

Title of the study: Technology and motivation to exercise: Data display formats, progress feedback, and strength of commitment for personal fitness

Thank you for taking this survey. The survey is composed of questions about data displays, and the focus is on your personal opinion. The purpose of the research is to determine whether or not the ways in which data is displayed influences people's perception of its value; value is defined as how informative, motivational, and persuasive the data is perceived to be. You will be asked to rate the informational and motivational value of different charts and graphs showing the same fitness information. As you view each display, please take sufficient time to understand what it is showing. Take as long as you need on each question. When you are ready to advance, click the red ">>" button along the bottom right of the page. **You will not be able to go back to previous pages so do not click the back button on your browser.** Your participation is entirely voluntary and you may exit the survey at any time or skip any questions without penalty or loss of benefits otherwise entitled. There are 81 questions and the survey should take around 20 minutes to complete. Your answers will be stored on a work computer owned by the Fisher College of Business, and only the survey administrator will have access to the survey results. The survey administrator will take all precautions to keep the survey results private and confidential, such as only storing the data on a Fisher computer that requires login. By advancing to the next page, you are giving consent for your answers to be used in the research analysis. Thank you for your participation and please email

weng.69@osu.edu for any questions or comments. For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251 or hsconcerns@osu.edu.

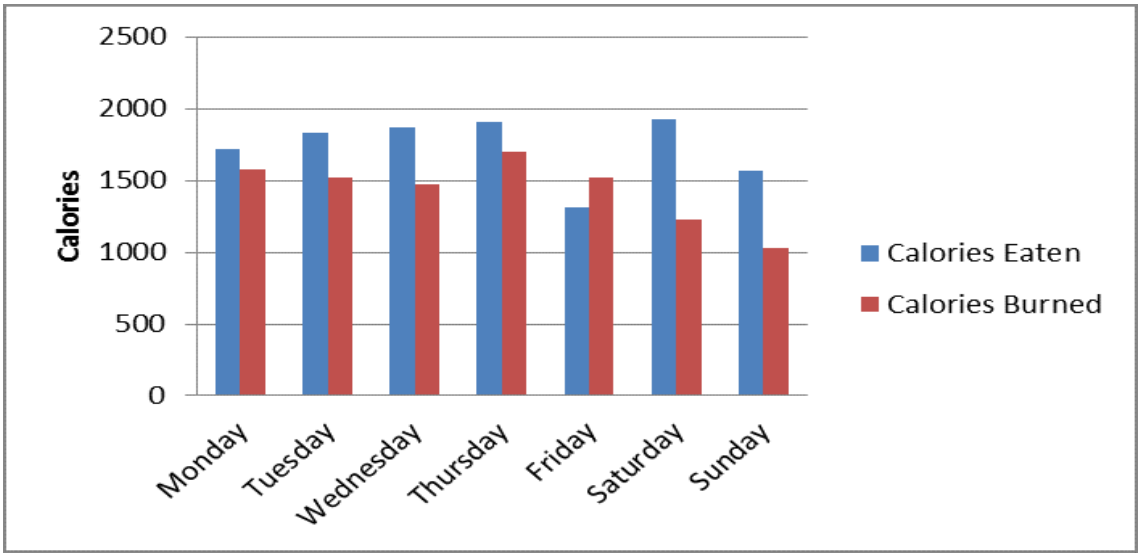
Q1 The following graph represents the calorie consumption and expenditure for a person over a 1 week period. Take as long as you need to review the graph, and move on to the next page when you are ready.



Q1 Based on the data from the previous graph, which day of the week was the amount of calories burned more than the amount of calories eaten?

- ❍ Monday (1)
- ❍ Tuesday (2)
- ❍ Wednesday (3)
- ❍ Thursday (4)
- ❍ Friday (5)
- ❍ Saturday (6)
- ❍ Sunday (7)

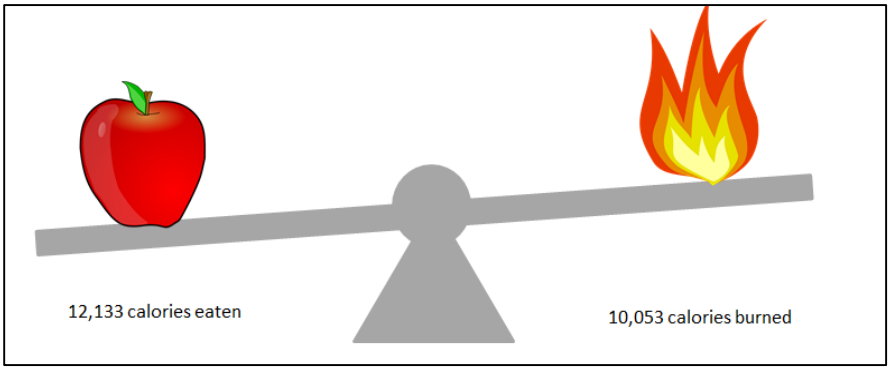
Q2 The following graph represents the calorie consumption and expenditure for a person over a 1 week period.



Q2 On a scale of 0 (not at all consistent) to 10 (very consistent), how consistent would you say this person is in balancing the amount of calories they've eaten vs the amount of calories they've burned?

_____ Drag the slider (1)

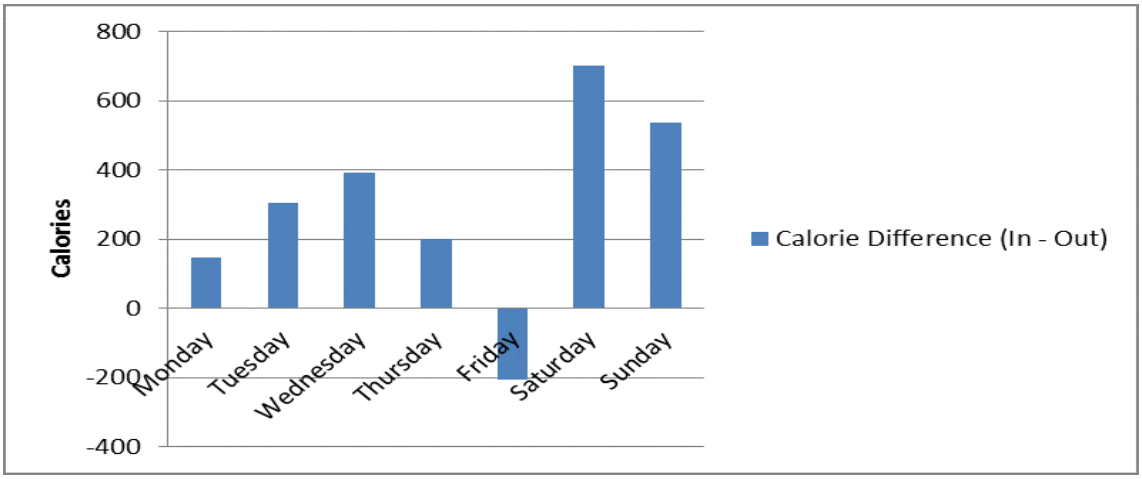
Q3 The following graphic represents the total amount of calories eaten vs the total amount of calories burned over a 1 week period.



Q3 On a scale of 0 (not at all balanced) to 10 (very balanced) how balanced do you consider the total calorie consumption vs expenditure to be?

_____ Drag the slider (1)

Q4 The following graph represents the calorie consumption and expenditure for a person over a 1 week period.

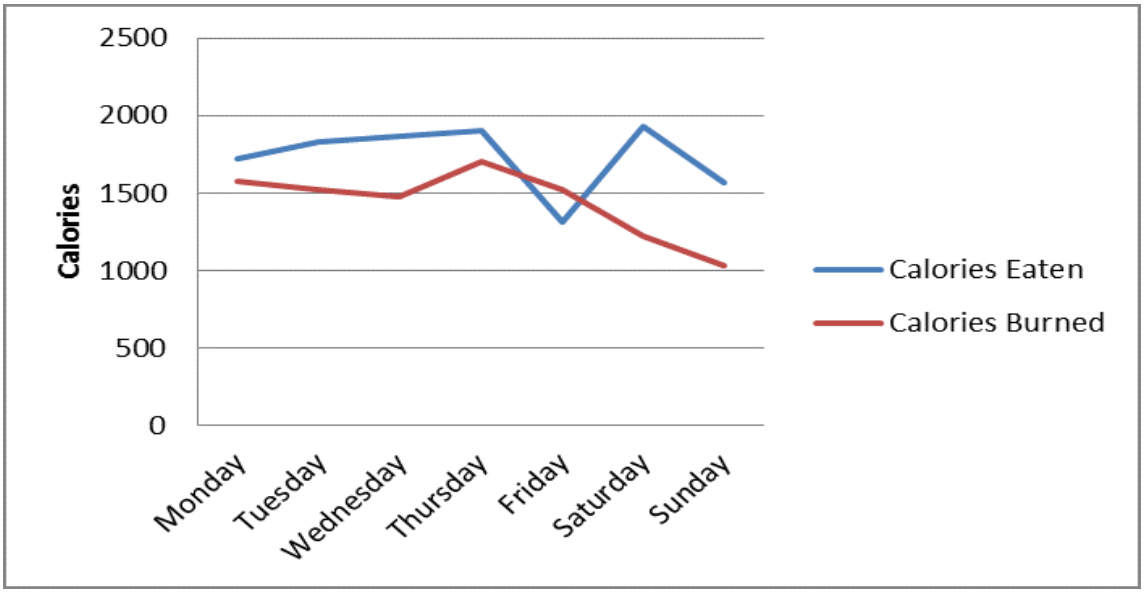


Q4 On a scale of 0 (not at all consistent) to 10 (very consistent), how consistent would you say this person is in balancing the amount of calories they've eaten vs the amount of calories they've burned?

_____ Drag the slider (1)

Q5 Imagine that you are trying to lose weight, and the following graphs represent the first week of your progress by showing the amount of calories you've eaten vs the amount of calories you've burned. On a scale of 0 (negative) to 10 (positive) please rate your personal reaction to each graph.

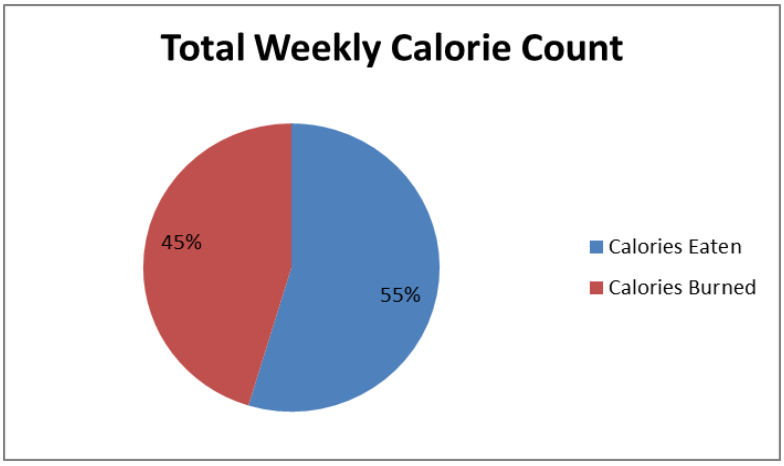
Q5 Graph 1



Q5

_____ Reaction to graph 1 (1)

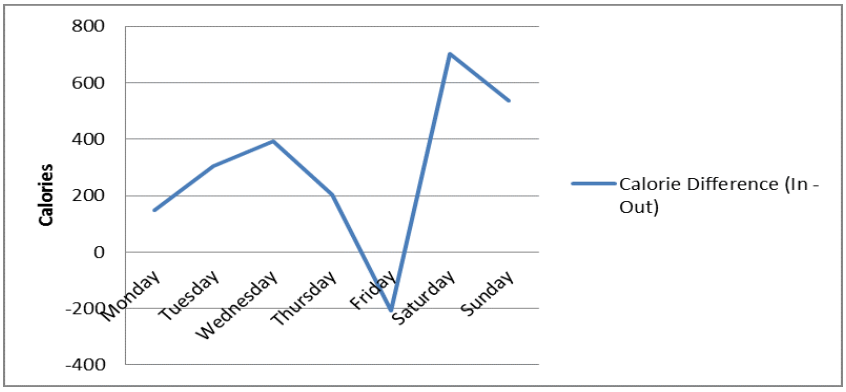
Q6



Q6

_____ Reaction to graph 2 (1)

Q7

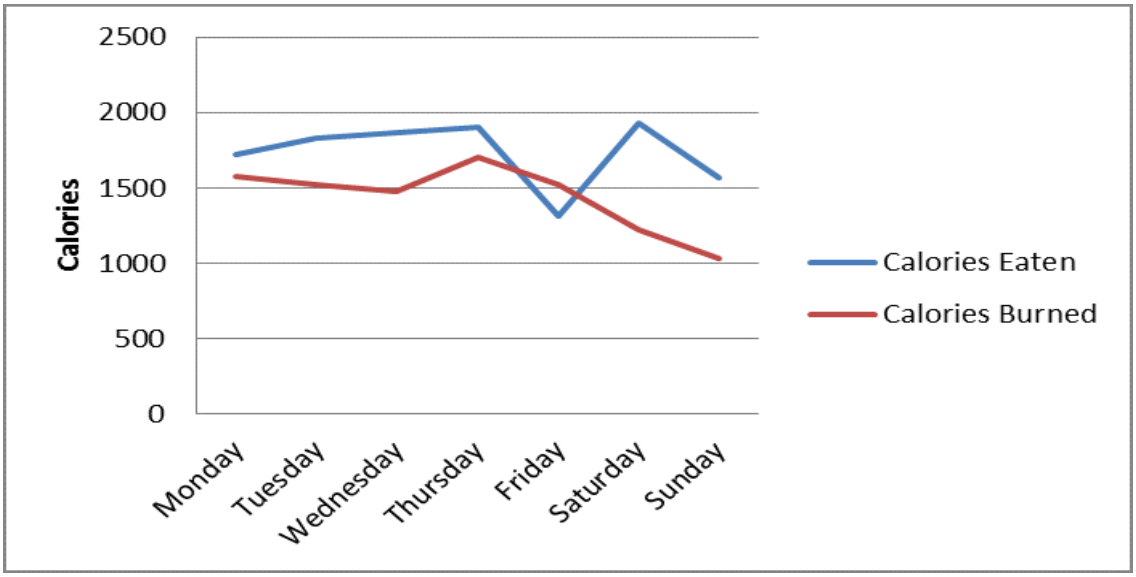


Q7

_____ Reaction to graph 3 (1)

Q8 Imagine that after looking at the graphs, your goal for the next week is to burn more calories than you eat. On a scale of 0 (not at all motivating) to 10 (very motivating), please rate how motivating you find each graph to be in getting you to eat healthier or exercise more.

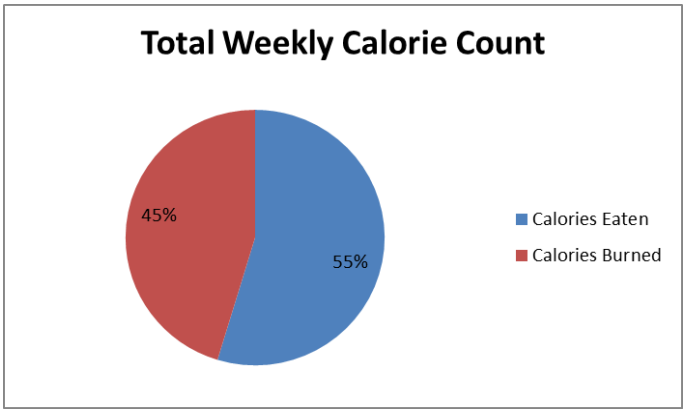
Q8



Q8

_____ Reaction to graph 1 (1)

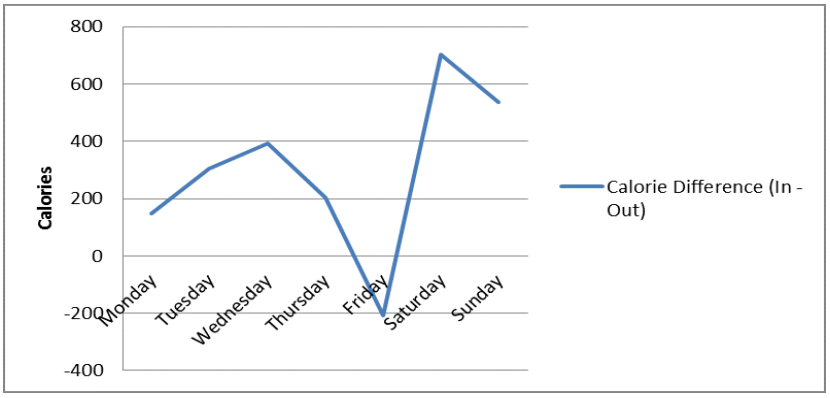
Q9



Q9

_____ Reaction to graph 2 (1)

Q10

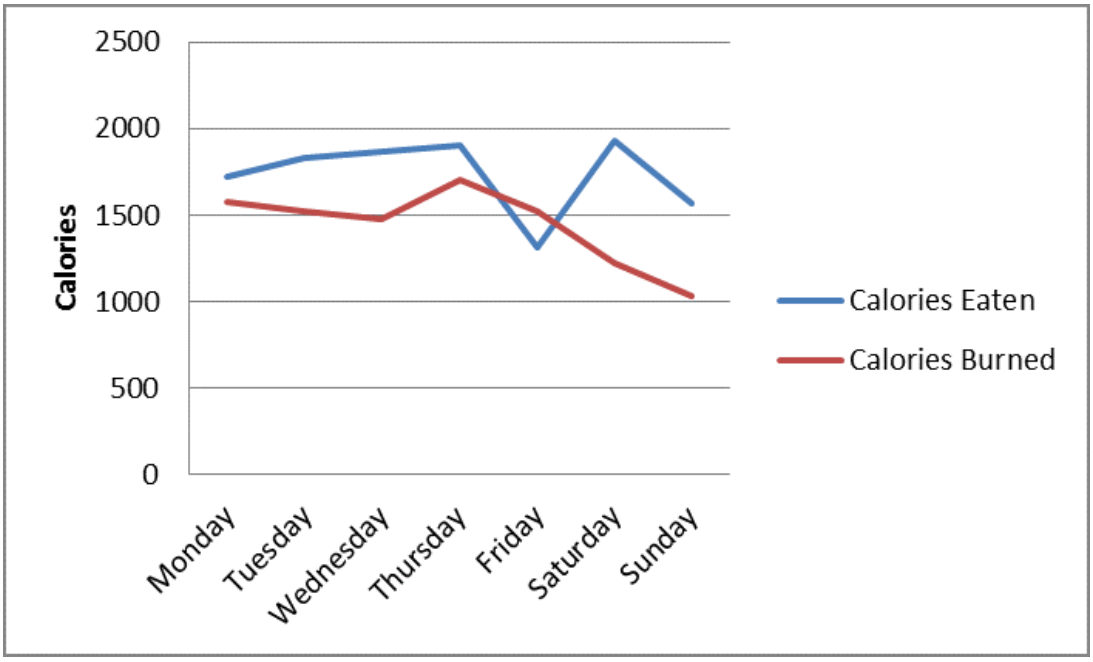


Q10

_____ Reaction to graph 3 (1)

Q11 Imagine that after looking at the graphs, your goal for the next week is to burn more calories than you eat. On a scale of 0 (not at all easy to understand) to 10 (very easy to understand), please rate how easy to understand you consider each graph to be.

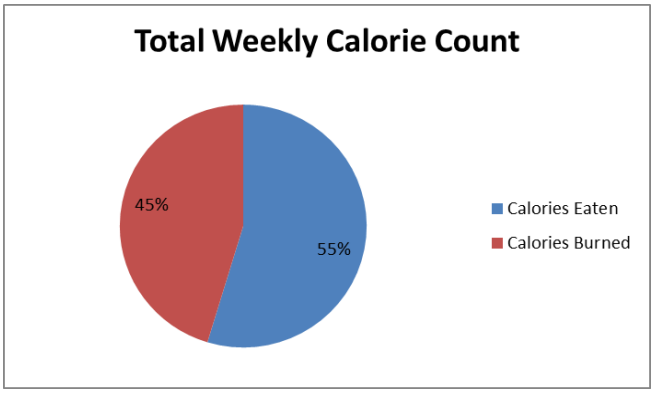
Q11



Q11

_____ Reaction to graph 1 (1)

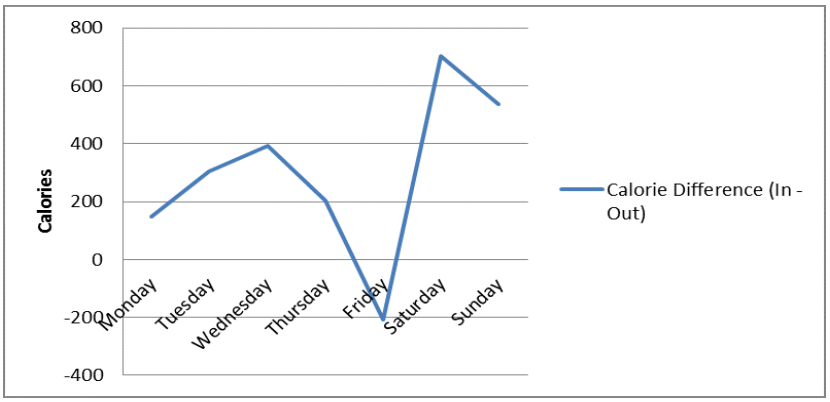
Q12



Q12

_____ Reaction to graph 2 (1)

Q13

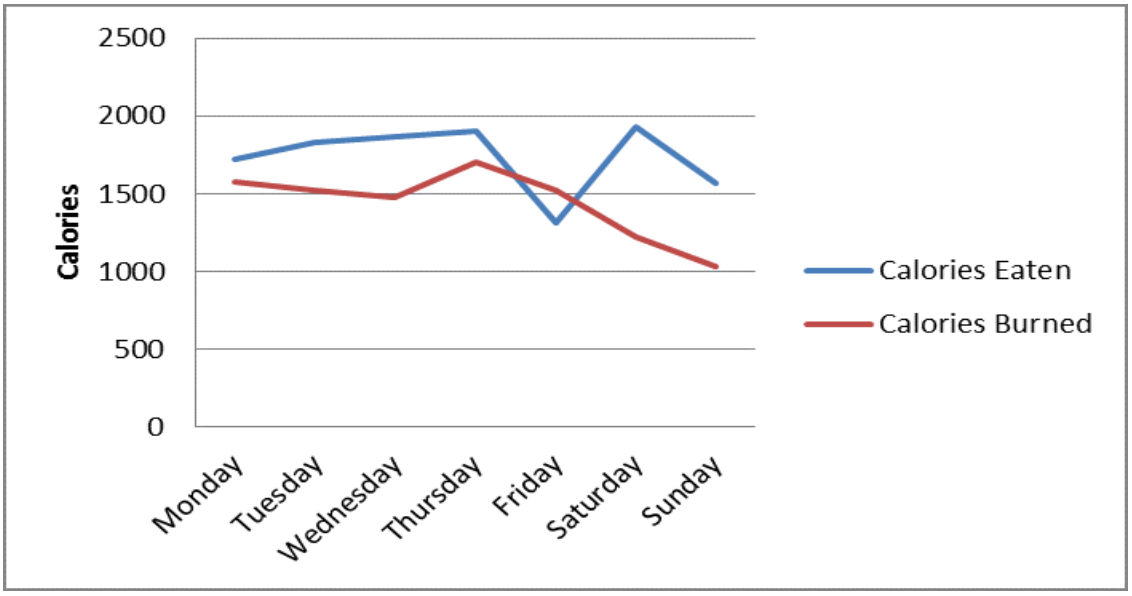


Q13

_____ Reaction to graph 3 (1)

Q14 Imagine that after looking at the graphs, your goal for the next week is to burn more calories than you eat. On a scale of 0 (not at all informative) to 10 (very informative), please rate how informative you consider each graph to be.

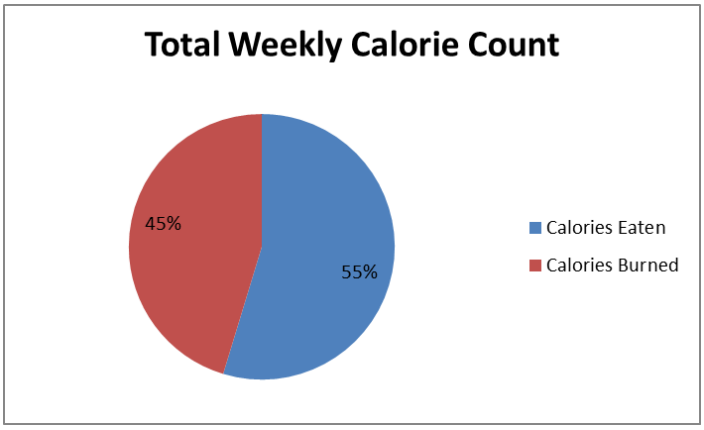
Q14



Q14

_____ Reaction to graph 1 (1)

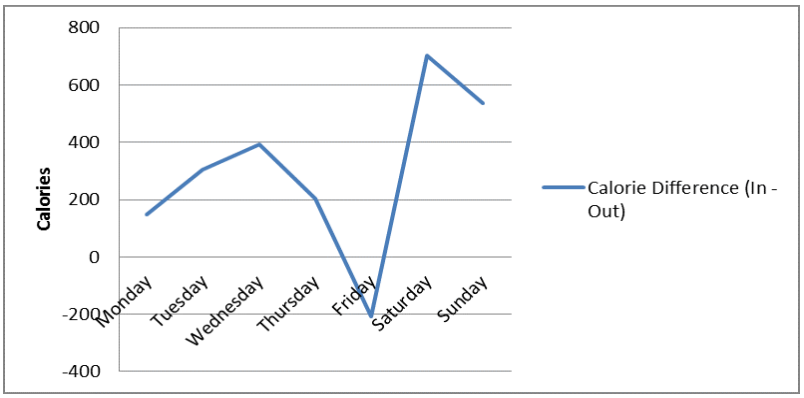
Q15



Q15

_____ Reaction to graph 2 (1)

Q16

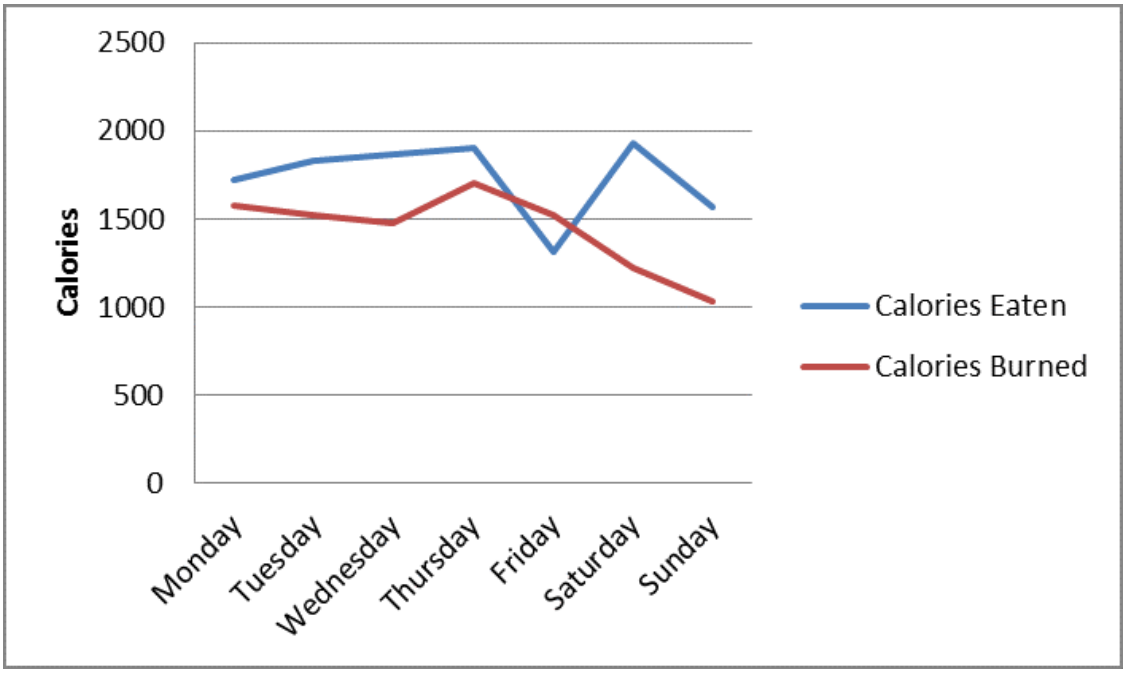


Q16

_____ Reaction to graph 3 (1)

Q17 Imagine that after looking at the graphs, your goal for the next week is to burn more calories than you eat. On a scale of 0 (not at all preferred) to 10 (very preferred), please rate each of the displays based on your personal preference for tracking (I.E. if you were using them to track your health).

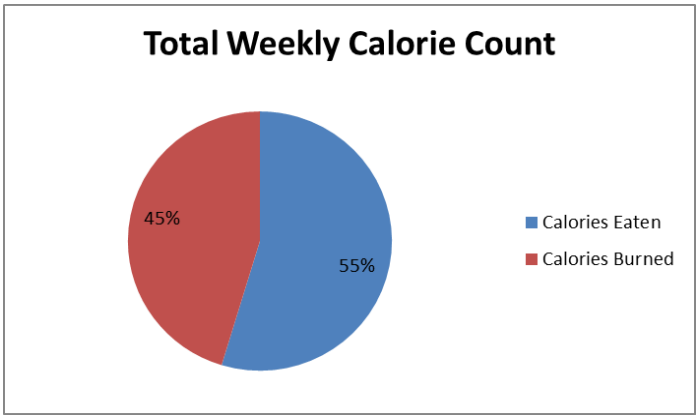
Q17



Q17

_____ Reaction to graph 1 (1)

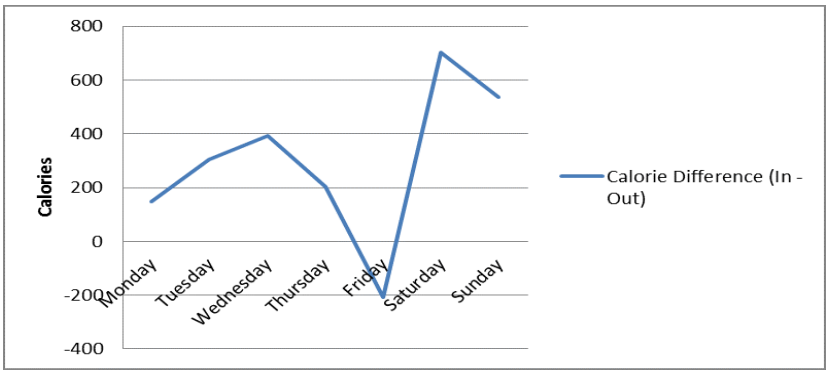
Q18



Q18

_____ Reaction to graph 2 (1)

Q19

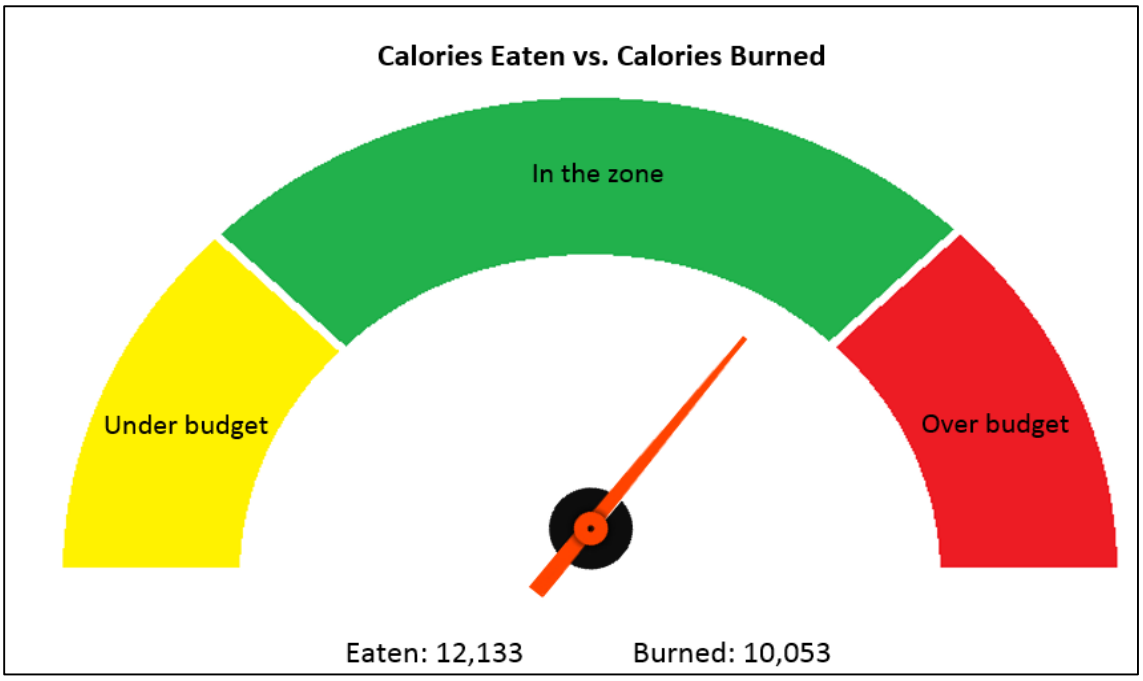


Q19

_____ Reaction to graph 3 (1)

Q20 Imagine that you also receive the following graph which represents the total amount of calories eaten vs the total amount of calories burned over the one week period.

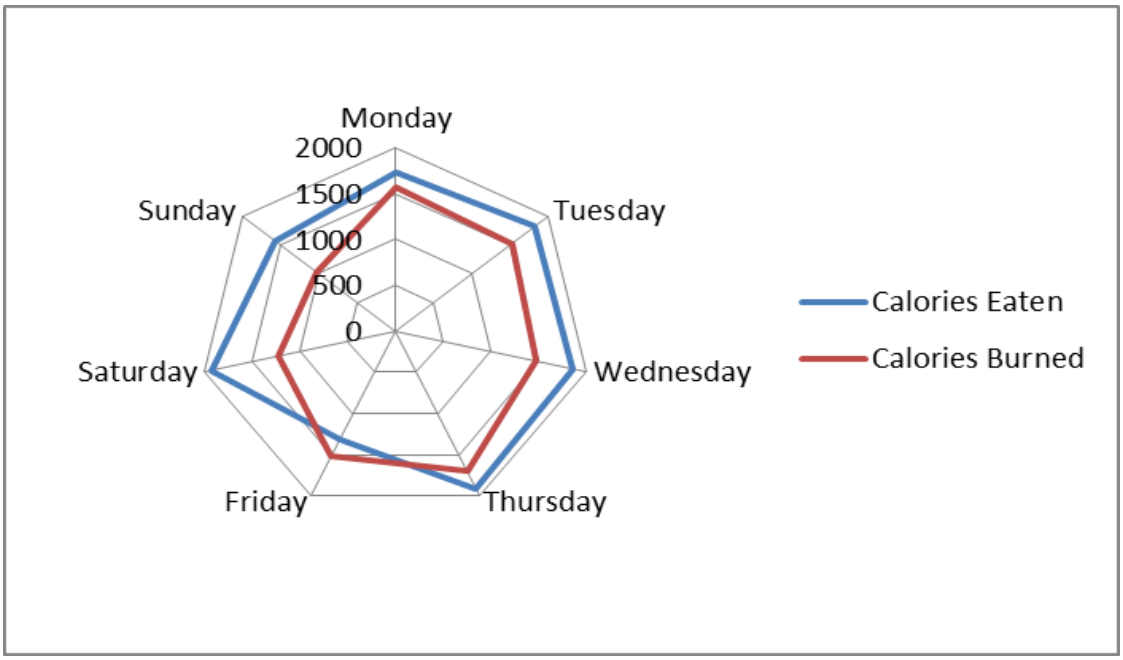
Q20



Q20 If you were attempting to balance the amount of calories eaten vs the amount of calories burned, on a scale of 0 (not at all successful) to 10 (very successful) how successful would you say you have been?

_____ Drag the slider (1)

Q21 On a scale of 0 (not at all balanced) to 10 (very balanced), how balanced do you consider the amount of calories eaten vs the amount of calories burned shown in the graph below?



Q21

_____ Drag the slider (1)

Q22 The following table represents the calorie consumption and expenditure for a person over a 1 week period. Take as long as you need to review the table, and move on to the next page when you are ready.

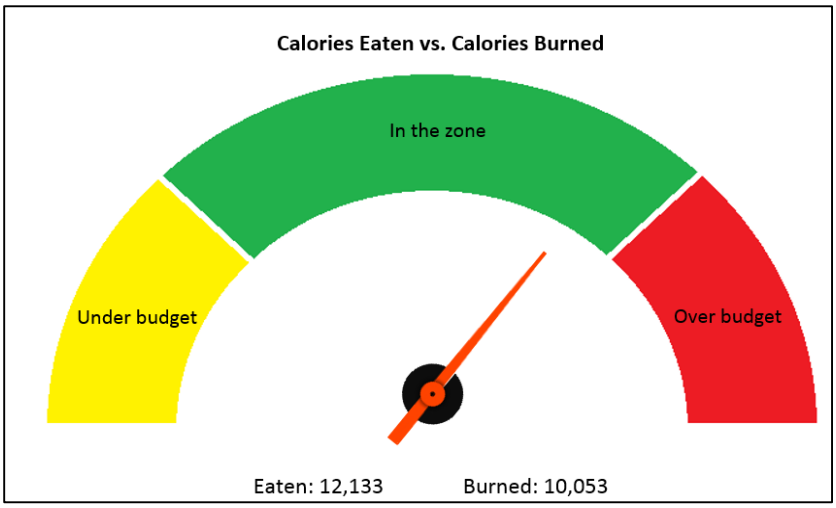
Weekly Calorie Intake and Expenditure			
	Calories Eaten	Calories Burned	Difference (In - Out)
Monday	1721	1573	148
Tuesday	1829	1524	305
Wednesday	1869	1476	393
Thursday	1905	1703	202
Friday	1314	1521	-207
Saturday	1928	1225	703
Sunday	1567	1031	536
Total	12133	10053	2080

Q22 Based on the data from the previous table, which day of the week was the amount of calories burned more than the amount of calories eaten?

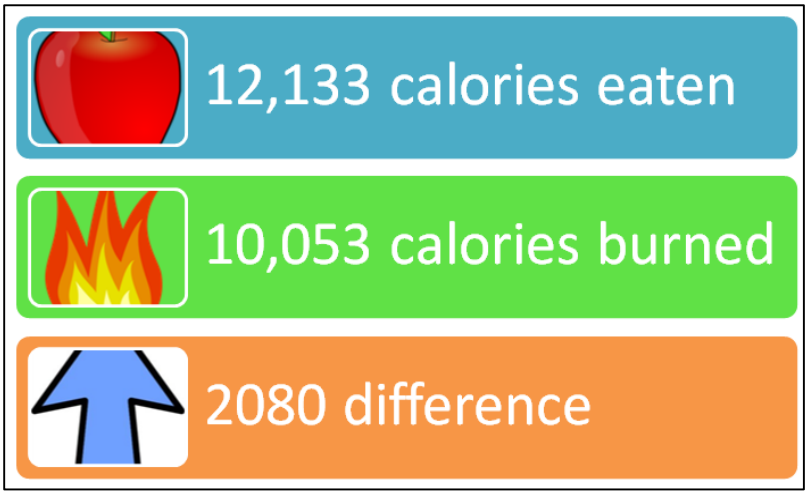
- Monday (1)
- Tuesday (2)
- Wednesday (3)
- Thursday (4)
- Friday (5)
- Saturday (6)
- Sunday (7)

Q23 The following displays represent the total amount of calories eaten vs the total amount of calories burned within a week.

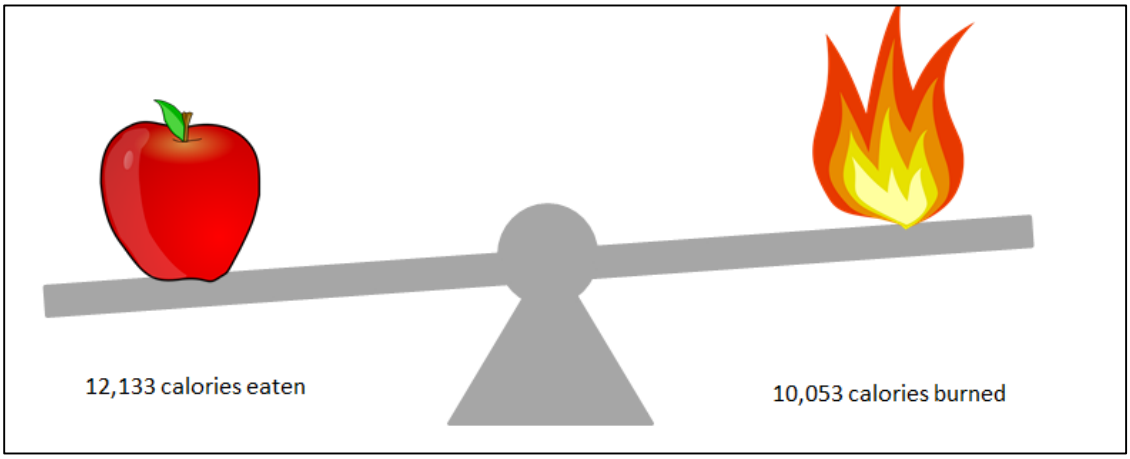
Q23 Display 1



Q23 Display 2



Q23 Display 3



Q23 Please rate the 3 displays based on clarity and ease of understanding, from 0 (not at all easy to understand) to 10 (very easy to understand).

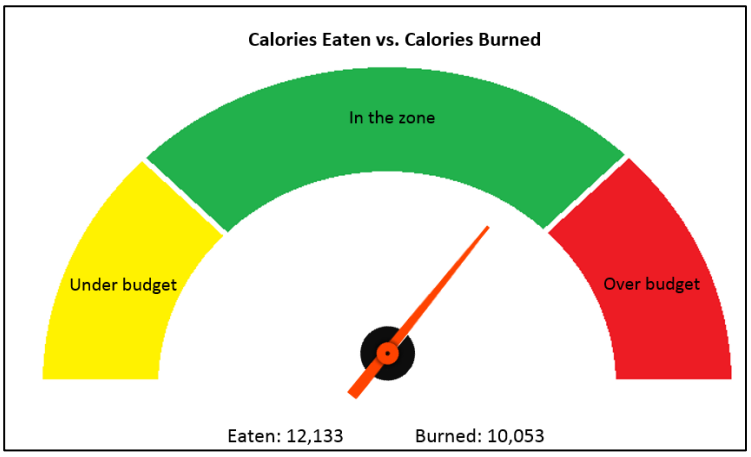
_____ Display 1 (1)

_____ Display 2 (2)

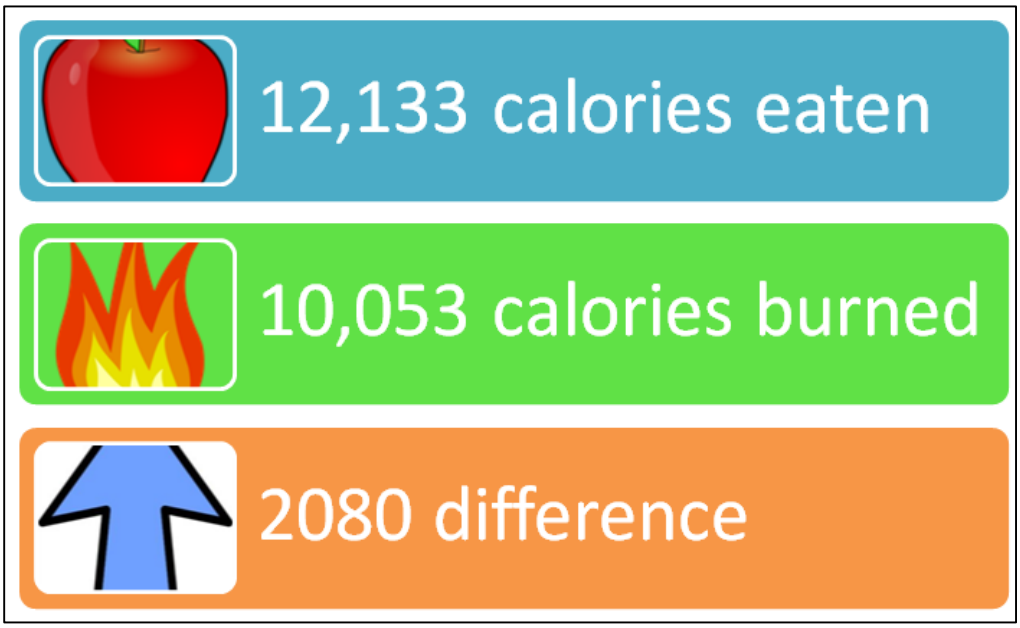
_____ Display 3 (3)

Q24 The following displays represent the total amount of calories eaten vs the total amount of calories burned within a week.

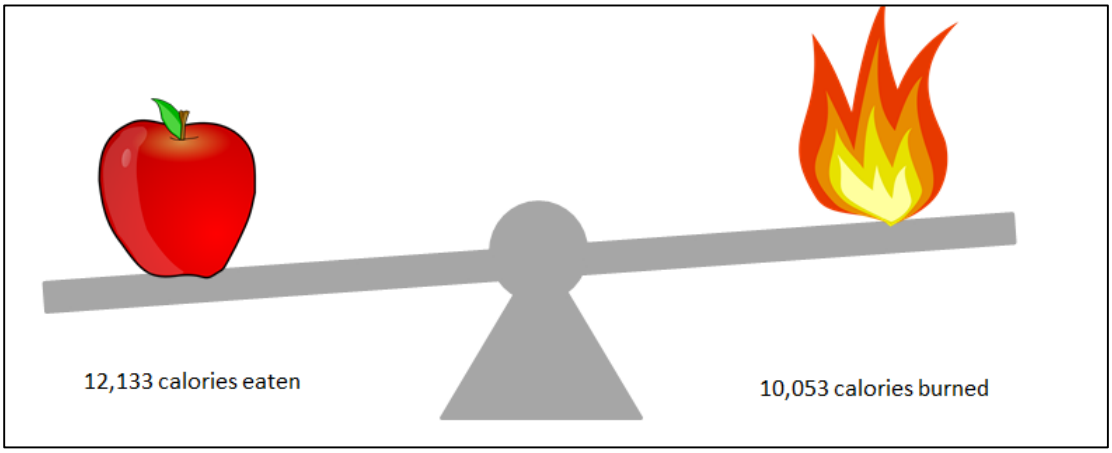
Q24 Display 1



Q24 Display 2



Q24 Display 3



Q24 Please rate the 3 displays based on their ability to motivate you to eat healthier or exercise more, from 0 (not at all motivating) to 10 (very motivating).

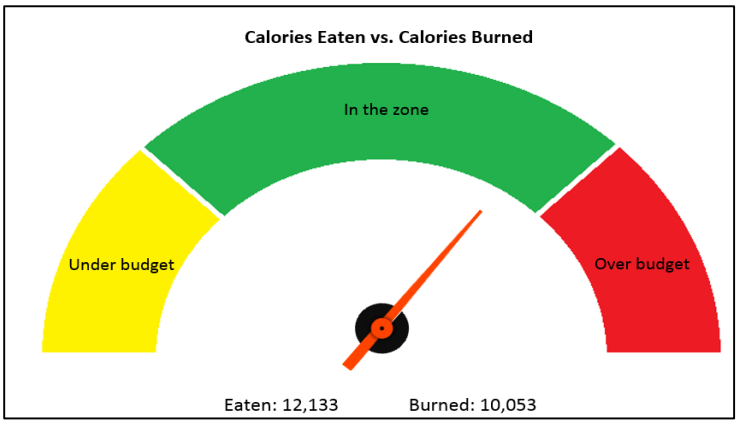
_____ Display 1 (1)

_____ Display 2 (2)

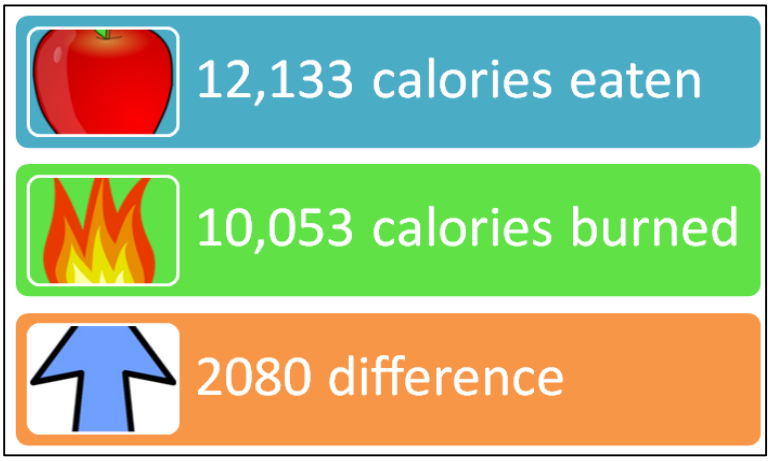
_____ Display 3 (3)

Q25 The following displays represent the total amount of calories eaten vs the total amount of calories burned within a week.

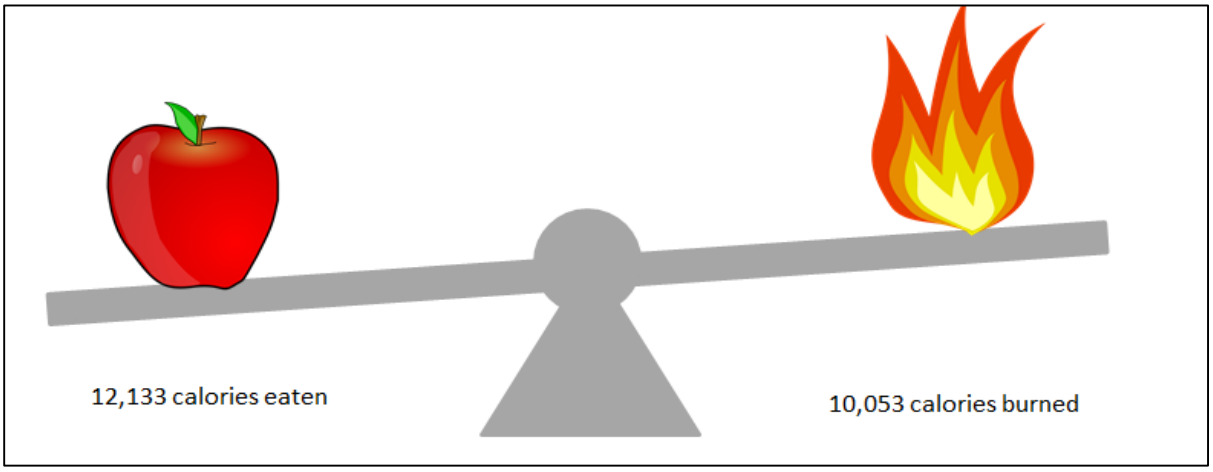
Q25 Display 1



Q25 Display 2



Q25 Display 3



Q25 Please evaluate each of the displays based on your personal preference for tracking (I.E. if you were using them to track your health), from 0 (not at all preferred) to 10 (very preferred).

_____ Display 1 (1)

_____ Display 2 (2)

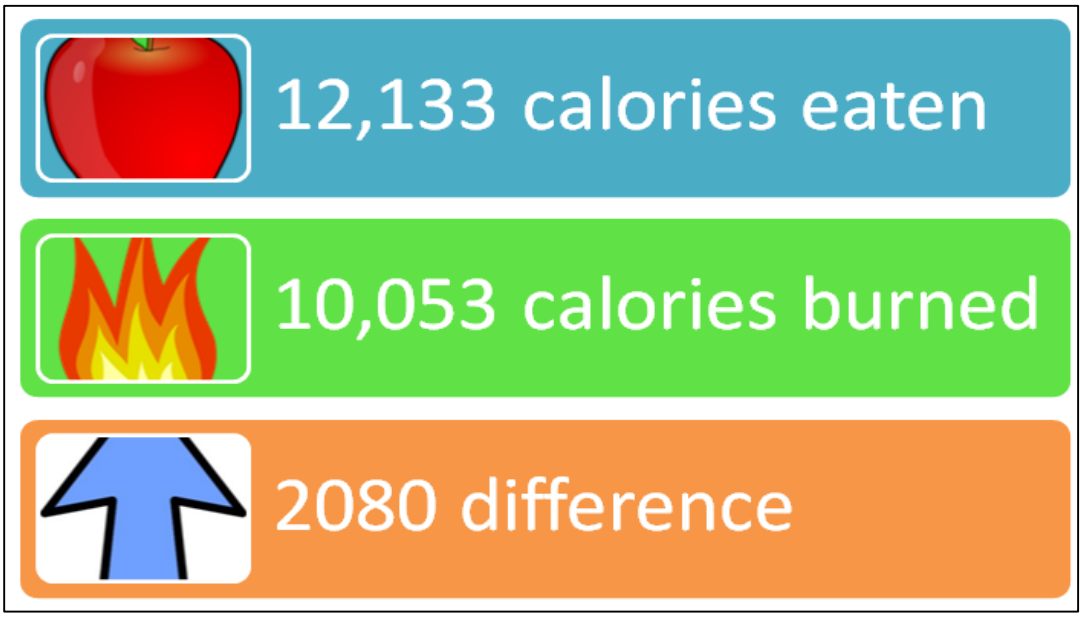
_____ Display 3 (3)

Q26 Please review the graphics below.

Q26 Graphic 1

Weekly Calorie Intake and Expenditure			
	Calories Eaten	Calories Burned	Difference (In - Out)
Monday	1721	1573	148
Tuesday	1829	1524	305
Wednesday	1869	1476	393
Thursday	1905	1703	202
Friday	1314	1521	-207
Saturday	1928	1225	703
Sunday	1567	1031	536
Total	12133	10053	2080

Q26 Graphic 2



Q26 How informative do you find each graphic, from 0 (not at all informative) to 10 (very informative)?

_____ Graphic 1 (1)

_____ Graphic 2 (2)

Q27 Which graphic do you prefer as a progress tracker?

- ❍ Graphic 1 (1)
- ❍ Graphic 2 (2)

Q28 Please review the graphics below.

Q28 Graphic 1

Weekly Calorie Intake and Expenditure			
	Calories Eaten	Calories Burned	Difference (In - Out)
Monday	1721	1573	148
Tuesday	1829	1524	305
Wednesday	1869	1476	393
Thursday	1905	1703	202
Friday	1314	1521	-207
Saturday	1928	1225	703
Sunday	1567	1031	536
Total	12133	10053	2080

Q28 Graphic 2

Q28 If you were monitoring your progress via a desktop or laptop computer, which graphic would you prefer?

- ❍ Graphic 1 (1)
- ❍ Graphic 2 (2)

Q29 If you were monitoring your progress via a mobile device (phones, tablets, etc.) with a smaller screen, which graphic would you prefer?

- ❍ Graphic 1 (1)
- ❍ Graphic 2 (2)

Q30 If you were monitoring your progress via a wearable fitness tracker (Fitbit, Apple Watch, etc) with a small screen which graphic would you prefer?

- ❍ Graphic 1 (1)
- ❍ Graphic 2 (2)

Q31 Imagine this table represents the amount of calories you ate vs the amount of calories you burned in 1 week.

Weekly Calorie Intake and Expenditure			
	Calories Eaten	Calories Burned	Difference (In - Out)
Monday	1721	1573	148
Tuesday	1829	1524	305
Wednesday	1869	1476	393
Thursday	1905	1703	202
Friday	1314	1521	-207
Saturday	1928	1225	703
Sunday	1567	1031	536
Total	12133	10053	2080

Q31 Based on the data in the table, to what extent do you feel motivated to eat healthier or exercise more?

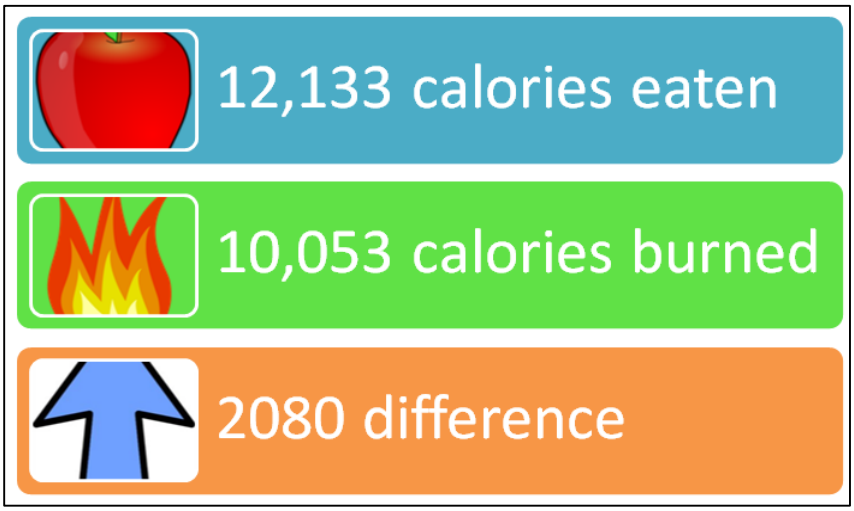
_____ Drag the slider (1)

Q32 Please describe why you chose your particular rating.

Q33 Please review the graphics below.

Q33 Graphic 1

Q33 Graphic 2



Q33 How informative do you find each graphic, from 0 (not at all informative) to 10 (very informative)?

_____ Graphic 1 (1)

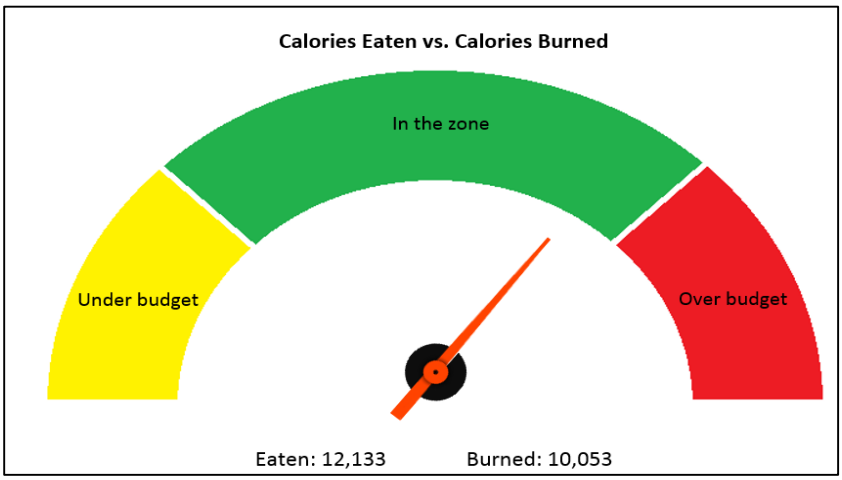
_____ Graphic 2 (2)

Q34 Which graphic do you prefer as a progress tracker?

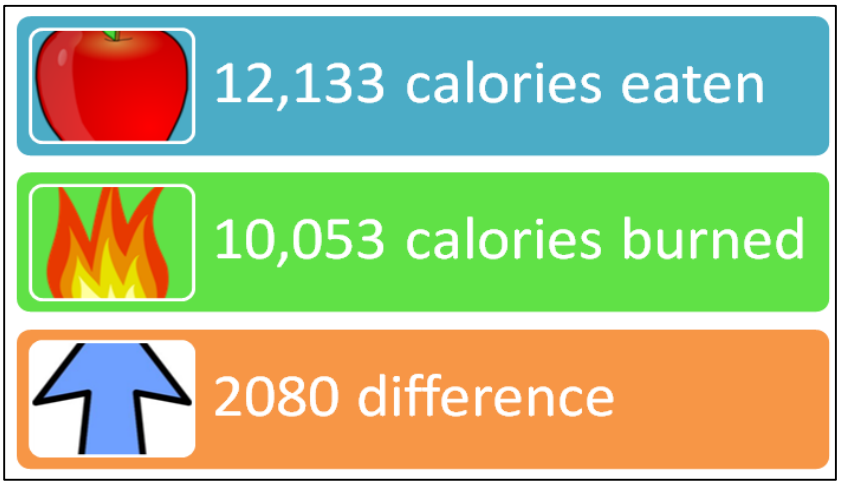
- ❍ Graphic 1 (1)
- ❍ Graphic 2 (2)

Q35 Please review the graphics below.

Q35 Graphic 1



Q35 Graphic 2



Q35 If you were monitoring your progress via a desktop computer or laptop, which graphic would you prefer?

- ❍ Graphic 1 (1)
- ❍ Graphic 2 (2)

Q36 If you were monitoring your progress via a mobile device (phones, tablets, etc.) with a smaller screen, which graphic would you prefer?

- ❍ Graphic 1 (1)
- ❍ Graphic 2 (2)

Q37 If you were monitoring your progress via a wearable fitness tracker (Fitbit, Apple Watch, etc) which graphic would you prefer?

- ❍ Graphic 1 (1)
- ❍ Graphic 2 (2)

Q38 Please rate how informative you find each data display to be, from 0 (not at all informative) to 10 (very informative). Choose "Not Applicable" if you are unsure what the data type looks like.

Q38 Drag the sliders

_____ Bar chart (1)

_____ Line graph (2)

_____ Pie graph (3)

_____ Table (4)

_____ Visual display (5)

Q39 Which of the following data displays have you previously encountered outside of this survey? Select all that apply.

- ❑ Bar chart (1)
- ❑ Line graph (2)
- ❑ Pie graph (3)
- ❑ Table (4)
- ❑ Visual display (5)

Q40 Which data display type do you encounter the most often?

- ❍ Bar chart (1)
- ❍ Line graph (2)
- ❍ Pie graph (3)
- ❍ Table (4)
- ❍ Visual display (5)
- ❍ Other (please specify) (6) _____

Q41 Please rate how meaningful you find each data display type in terms of content and layout from 0 (not at all meaningful) to 10 (very meaningful). Choose "Not Applicable" if you are unsure what the data type looks like.

_____ Bar chart (1)

_____ Line graph (2)

_____ Pie graph (3)

_____ Table (4)

_____ Visual display (5)

Q42 Please rate how important you find each characteristic in a data display from 0 (not at all important) to 10 (very important).

Q42 Drag the sliders

_____ Informative (1)

_____ Aesthetically pleasing (2)

_____ Clear and easy to understand (3)

_____ Portable (able to display correctly on multiple devices) (4)

_____ Colorful (5)

Q43 Based on your personal opinion, how many data sets do you believe were used to make the graphs, tables, and other displays used in this survey?

- ❍ 1 (1)
- ❍ 2 (2)
- ❍ 3 (3)
- ❍ 4 (4)
- ❍ 5 (5)
- ❍ More than 5 (6)

Q44 What device are you using to take this survey?

- ❍ Desktop computer (1)
- ❍ Laptop computer (2)
- ❍ Mobile tablet (i.e. Apple iPad) (3)
- ❍ Mobile phone (4)
- ❍ Other (please specify) (5) _____

Q45 Which devices have you owned or used? Please select all that apply. (Note: testing a device for a short period of time, such as in a retail store, does not count as "used").

- ❑ Apple Watch (1)
- ❑ FitBit (2)
- ❑ Pedometer (3)
- ❑ Other smartwatch (4)
- ❑ Other physical activity tracker (please specify) (5) _____

Q46 Optional Please write any comments you have about the survey.

Appendix B: Survey Responses

Initial Report

Last Modified: 02/15/2016

Filter By: Report Subgroup

1. Timing

#	Answer	Average Value	Standard Deviation
1	First Click	9.62	67.83
2	Last Click	10.82	68.17
3	#QuestionText, TimingPageSubmit#	60.95	208.55
4	#QuestionText, TimingClickCount#	0.39	1.04

2. Based on the data from the previous graph, which day of the week was the amount of calories burned more than the amount of calories eaten?

#	Answer		Response	%
1	Monday		8	3%
2	Tuesday		7	2%
3	Wednesday		19	7%
4	Thursday		24	9%
5	Friday		157	56%
6	Saturday		61	22%
7	Sunday		5	2%
	Total		281	100%

Statistic	Value
Min Value	1
Max Value	7
Mean	4.84
Variance	1.30
Standard Deviation	1.14
Total Responses	281

3. Timing

#	Answer	Average Value	Standard Deviation
1	First Click	14.04	16.62
2	Last Click	15.30	17.44
3	#QuestionText, TimingPageSubmit#	18.06	19.17
4	#QuestionText, TimingClickCount#	1.30	1.27

4. On a scale of 0 (not at all consistent) to 10 (very consistent), how consistent would you say this person is in balancing the amount of calories they've eaten vs the amount of calories they've burned?

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Drag the slider	0.00	10.00	5.93	2.09	277

5. On a scale of 0 (not at all balanced) to 10 (very balanced) how balanced do you consider the total calorie consumption vs expenditure to be?

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Drag the slider	0.00	9.50	5.17	2.11	269

6. On a scale of 0 (not at all consistent) to 10 (very consistent), how consistent would you say this person is in balancing the amount of calories they've eaten vs the amount of calories they've burned?

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Drag the slider	0.00	8.50	3.26	1.92	263

7.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 1	0.20	9.30	4.29	2.02	261

8.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 2	0.00	10.00	5.30	2.21	271

9.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 3	0.00	9.30	3.85	1.90	276

10.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 1	0.00	10.00	5.42	2.20	269

11.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 2	0.00	10.00	6.11	2.15	273

12.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 3	0.00	10.00	4.87	2.41	269

13. If you were attempting to balance the amount of calories eaten vs the amount of calories burned, on a scale of 0 (not at all successful) to 10 (very successful) how successful would you say you have been?

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Drag the slider	0.00	10.00	6.21	2.13	277

14.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Drag the slider	0.00	10.00	4.78	1.90	273

15. Timing

#	Answer	Average Value	Standard Deviation
1	First Click	2.25	12.08
2	Last Click	3.12	13.52
3	#QuestionText, TimingPageSubmit#	34.27	84.25
4	#QuestionText, TimingClickCount#	0.29	0.69

16. Based on the data from the previous table, which day of the week was the amount of calories burned more than the amount of calories eaten?

#	Answer		Response	%
1	Monday		4	1%
2	Tuesday		4	1%
3	Wednesday		13	5%
4	Thursday		21	7%
5	Friday		223	79%
6	Saturday		13	5%
7	Sunday		3	1%
	Total		281	100%

Statistic	Value
Min Value	1
Max Value	7
Mean	4.80
Variance	0.67
Standard Deviation	0.82
Total Responses	281

17. Timing

#	Answer	Average Value	Standard Deviation
1	First Click	9.30	15.81
2	Last Click	9.95	16.36
3	#QuestionText, TimingPageSubmit#	12.33	22.58
4	#QuestionText, TimingClickCount#	1.15	0.50

18. Please rate the 3 displays based on clarity and ease of understanding, from 0 (not at all easy to understand) to 10 (very easy to understand).

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Display 1	0.00	10.00	7.22	2.21	281
2	Display 2	0.00	10.00	7.82	2.09	279
3	Display 3	0.00	10.00	7.19	2.12	277

19. Please rate the 3 displays based on their ability to motivate you to eat healthier or exercise more, from 0 (not at all motivating) to 10 (very motivating).

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Display 1	0.00	10.00	7.02	2.40	276
2	Display 2	0.00	10.00	6.73	2.39	273
3	Display 3	0.00	10.00	6.72	2.21	275

20. Please evaluate each of the displays based on your personal preference for tracking (I.E. if you were using them to track your health), from 0 (not at all preferred) to 10 (very preferred).

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Display 1	0.00	10.00	6.76	2.76	268
2	Display 2	0.00	10.00	7.01	2.58	272
3	Display 3	0.00	10.00	5.86	2.61	265

21. How informative do you find each graphic, from 0 (not at all informative) to 10 (very informative)?

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Graphic 1	2.30	10.00	8.71	1.72	272
2	Graphic 2	1.40	10.00	7.10	2.05	262

22. Which graphic do you prefer as a progress tracker?

#	Answer		Response	%
1	Graphic 1		192	71%
2	Graphic 2		80	29%
	Total		272	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.29
Variance	0.21
Standard Deviation	0.46
Total Responses	272

23. If you were monitoring your progress via a desktop or laptop computer, which graphic would you prefer?

#	Answer		Response	%
1	Graphic 1		218	80%
2	Graphic 2		55	20%
	Total		273	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.20
Variance	0.16
Standard Deviation	0.40
Total Responses	273

24. If you were monitoring your progress via a mobile device (phones, tablets, etc.) with a smaller screen, which graphic would you prefer?

#	Answer		Response	%
1	Graphic 1		79	29%
2	Graphic 2		194	71%
	Total		273	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.71
Variance	0.21
Standard Deviation	0.45
Total Responses	273

25. If you were monitoring your progress via a wearable fitness tracker (Fitbit, Apple Watch, etc) with a small screen which graphic would you prefer?

#	Answer		Response	%
1	Graphic 1		46	17%
2	Graphic 2		226	83%
	Total		272	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.83
Variance	0.14
Standard Deviation	0.38
Total Responses	272

26. Based on the data in the table, to what extent do you feel motivated to eat healthier or exercise more?

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Drag the slider	0.00	10.00	6.65	2.13	273

27. Please describe why you chose your particular rating.

Text Response
I like the amount of detail that can be gained from this graphic but a more visual representation of calories in and out might be more motivating.
Information is specfic and clear, but there's too much information and makes people dont want to look at it.
This graph shows exact numbers, so you can actually track your progress using sufficient data.
I like how the table has the columns that show the individual numbers of calories consumed and calories burned then the actual difference between the two so one can see right away the amount
Seeing the positive and negative numbers on the far right help me to understand if I've exceeded my goal or come in under. I find the exact numbers very motivating, as I try to lower it every day.
I felt that looking at this chart made me more motivated because it is breaking down how many calories you have eaten and burned per day and also showing the difference. I think that this graphic is the easiest to read and understand which also makes it easy to feel more motivated because seeing a negative sign means you burned more calories than you ate which is a sign of weight lose eventually!
This graph does a great job of breaking it down to specific day, which would help greatly in realizing when your diet is successful versus when it is not
I can see how I'm doing everyday and compare the days
It's comprehensive
I see that the differences are a majority positive, showing that I have been eating more than I have been burning, so I am motivated to exercise more and make it so all of the differences are negative and I am eating less than I am burning. One way to motivate me more would be to have the positive number differences be in red, which is bad and not the goal of weight loss or healthy eating, and make a zero and negative number difference green, because this is the healthy zone.
I am someone who focuses on what I eat a lot so seeing exactly how many calories I am away from even is very helpful and helps me feel motivated knowing how close I am.
I would be more motivated if I knew the average percentage that we're expected to burn off to be more healthy
I like being able to analyze exact numbers and calculate what I need to do to eat better and assess meal plans per day. What did I eat Friday? What excercising is the most effective for calorie burning? Etc.
It can track daily calories eaten and burned, so I can compare in daily basis. Calorie actually depends on how much activity I do and how much foods I ate and it changes in daily. So, I can track where the high calorie comes from and why I cannot lose weights by looking back what I did and what I ate on each day.
The data displayed in the chart is somewhat hard to understand. I have to browse through numerous set of data to track how well i am doing, and the data does not seems to make sense.

I chose this rating because it is very easy to see that you have a surplus of calories, which will lead to weight gain instead of weight loss. This should motivate you to eat less and workout longer or harder
I look at this chart and I want to cry. It takes too long for me to understand what I'm looking at; it is boring. No. Maybe if I cared more it would be interesting but it is boring.
I can see the for the difference (in-out), almost all the numbers are positive, except Friday. Therefore, there's a clear signal telling that we are eating more calories than we delivered out.
Shows me in numbers very clearly how much calories I have eaten and then how much I burned, not to mention the difference between calories consumed and burned.
There are too many numbers to keep track of. I like it when things are simple
I like this graphic because I am able to see exactly what days I need to improve on and which days i can continue my daily eating habits. Because of this clarity, I can make myself motivated to work out on the specific days that I am over the calorie count. That way it is not as overwhelming as just seeing you are simply "over" the calorie budget you said and not knowing when or how you got to that point.
This graph tells me that I am not accomplishing my goal and am over my goal by 2080 calories per week. However, it clearly states each day why i am not reaching my goals and shows me where i need to improve
Numbers measure and track how well I've done over the past week, but in no way does it motivate me. My goal motivates me to lose weight. If you focus on just the numbers you might resort to unhealthy eating habits, which I have done.
I chose six because seeing that most days I am eating more than I burn would motivated me to eat healthier or exercise more, but since these are not true stats for me, I am not as motivated as I would have been had they been my stats.
I like seeing numbers laid out in succession so that I can see the trends in numbers. Seeing the progression and especially the difference in the calories in and out.
I look at enough excel bs outside of the gym
I like how it shows specific days calorie intake and output. I also like the difference column but I am a visual personal and like added color and graphics
I feel that it is pretty balanced so I am not that motivated.
Easy to see & understand daily breakdown or calorie intake.
Very informative. Solid numbers are motivating
I'd rather see big picture.
I feel more motivated to eat better because 6 out of the 7 days, I have consumed more than I have burned. Also my difference is 2000 calories more per week than it should be, which is not good for my exercise plan and encourages me to workout more or change my diet. I wouldn't rate it any higher than a 7.5 because per day, I am only over by around 150 calories which is comparable to a granola bar.
since the difference in calories are too small
I feel more motivated to eat healthier because I didn't do as well last week as I want to. But I didn't rate it very high because it is obviously going to be a more drastic change so it will be harder to do and would make me more hesitant.
The table is a very general representation of people's consumption habits. Moreover, I've

been looking at it in the context of a survey "simulation", and so have not been personally applying it to my life at all. Thus I am not greatly motivated by it.
I like that this chart shows you your different calories in a clear, linear way, and the days of the week are very comparable. Since its easy to compare, it makes me want to feel proud of myself each day of the week. However, since it is a little boring to look at it, its not quite as motivating as it could be.
Not very motivated because the table is just a wall of numbers and kind of intimidating, despite how informative it is.
This graph really shows that I eat a lot more calories on the weekends, which is to be expected. In order to lose weight, you need a calorie deficit so I would be motivated to work out harder and eat better because according to the data, you won't be losing much weight, if any at all and you might even be gaining weight.
Just knowing calorie intake is not a motivating factor for me
Gives a detailed breakdown. More details means I can make a better decision.
It's really informative and detailed, but it takes some thought to comprehend. It also doesn't give any goals or anything. I think if it displayed having a goal of zero or lower and then how far off you were from that goal then it would be more motivating. Also, it's very dull.
Although this is the most informational of the options so far it doesn't necessarily motivate me to work out
The graphic just does not appeal to me or light any sort of motivation in me to do better. With so much information available its overwhelming.
It is a lot of numbers to try to comprehend so I don't feel as motivated.
The amount of data is a bit overwhelming and makes it seem like it will be difficult to eat healthier and exercise more.
Only one day is in a deficit
Poor visual. Not motivating
It is just data. There really isn't anything that would motivate me.
You are given the difference in calories, this causes me to think, "Oh, another hour or so of cardio would have given me a deficit for the day."
Because out of all the graphs, it is the most informative. It gives the amount of extra calories I'm taking in versus burning. In essence, I have precise numbers so I know which days I need to work on more in order to see results in weight loss.
Informational
because the calories gained clearly outweigh the calories burned
I would be more motivated to eat healthier because I can see that every day except Friday I go over on calories eaten vs. burned. Doing this every week, would make me gain weight. These numbers open my eyes to each day, and make me think why Friday is so low compared to others.
I am slightly motivated to exercise more. It is easier to identify the days in which calories eaten are far greater than the calories burned. It is easier to track, but the visually appealing graphics also contribute to motivation.
I chose an 8 because I like seeing the details of my goals and then I find it easier to understand where I am going wrong. Also it motivates me more to do better the next

week if I have a concrete number each day to compare my current progress.
I would be able to see that I am taking in more calories than I am burning 6/7 days per week
Knowing exactly what I'm doing every day would motivate me more.
It gives information on a day to day basis and is more descriptive in that way. It is missing if each daily nutritional requirements were met though as eating healthier involves more than just calories. You can be unhealthy and eat unhealthy even when eating less calories. Overall, though the graph shows that there is not a calorie deficit, which would be motivating and also motivating to help be more conscious of eating habits.
because the such high calorie intakes makes me want to lose weight
The calorie difference is not huge so I would not feel the need to exercise.
Seeing the exact numbers would motivate me to get my diet in balance.
It's very informative and I am able to see my caloric intake, but I have to work harder to figure out how to improve.
When you see the specifics you know the details to keep you motivated
I can see specifically how each day is affecting my overall calorie intake and workout schedule
The graph overall indicates the calories burned are not greater than calories consumed. If I was trying to lose weight to be healthier this is pretty informative. However, it is missing nutritional information and if those requirements were met or not. Eating healthy means more than just calories consumed, but if proper nutrients are taken in. You can still lose weight and consume less calories than burned and still be unhealthy. Overall, for weight loss it is pretty motivating.
this table is too limited. when manipulating weight it is very important to not only look at calorie consumption but also where those calories are coming from. protein calories take a very different role than the calories you get from MC Donalds fries. In my own experience i find it much more useful to watch things like proteins fats and carbs as opposed to just looking at calories because that tends to work better when on a cut.
I think this table is really good for gathering information and tracking how you're doing but it's layout doesn't necessarily motivate me to want to do more than I'm already doing.
I would want at least 2-3 more days to be a negative difference.
This chart appears too bland, and nothing really jumps out at me.
I feel like it allows for a more daily goal.
Based on the data, I feel quite motivated to eat healthier and exercise; something I have been planning to do for a while. However, although there is data and graphs, I still have some lazy reservations about it; hence my rating of 7.8
At first glance it's just a bunch of numbers in a table. In a way, it's hard to be motivated enough to even look through all the numbers and analyze what they all mean, let alone be motivated to get healthy. I would prefer something quick-hitting and in my face.
Seeing the amount of calories I am eating makes me want to monitor it more
Too much information.
I feel like this is a good ratio of intake to calories burned
I chose the rating because it provides a lot of information, but also overwhelms me. If i

was to use that table, I may lose sense of what I'm looking for.
The calorie difference per day is not very large. So I feel I don't need to do much more
Just numbers. Not too exciting, not motivating
I'm in the middle. You are not eating that many calories during the week and your body needs calories so this would not motivate me too much
There is no target for where I should be but I do see that I am over eating so I need to control that.
I should essentially burn all or more calories than I ate in order to lose weight, but only holding on to about 2000 of my week's calorie count doesn't seem too bad. I chose a 7 because I should burn more, but I'm also proud of my progress.
the image is just numbers, very boring, not exciting, its informative but not motivating
I feel more motivated because I am able to see where I am during the week and what days I need to focus on my calorie intake and exercise regimen more.
I think this table is motivating because you can tell that the goal is not unattainable. You are within reach and that would make me want to work harder because as a former athlete and competitor you don't stop until you "win"
I think by seeing the individual days it helps you pen point what days you want to work harder on burning calories.
I would be motivated to see a lower number for my differential. I, personally, think I would like being able to see the numbers and see how many calories I'm consuming in comparison to how many I am burning. I chose a very high rating in accordance.
I can keep track of my calorie intake and expenditure day by day, which encourage me to live healthy everyday
I see that I was able to have negative calories one day and that motivates me to try and do the same thing more often. Also, I see how I have to opportunity to make my calorie difference more consistent and reduce weekend binge eating.
I think it is helpful to see how much you consume v. eat but is too much to look at
I like lots of data to help me in determining my stance. This table lays out each day's calorie intake and amount burned. It allows me to see what days need to be worked on and which days I can keep the status quo.
It motivates me by showing me how my intake and output varies, so it motivates me to exercise more on certain days.
i feel more motivated by seeing the numbers
Its hard to read
i can see that one day was very good for me and try to make more good days like that one next week
Having numbers for the whole week lets me see how I have been doing and motivates me to make changes to improve these results.
Seeing the actual numbers and my progress would motivate me a little but I think I would still want more information or at least the ability to input more.
2000 calories over is almost a pound...and if I were trying to lose weight, that's not good.
This graph makes it very easy to see my progress and work that I am doing. It is motivational when I see I am having good results
I just don't know if the bare bone facts would be enough to motivate me.

The data table does not motivate me to be healthier because it is very bland to look at, and a little hard to understand what the numbers mean.
I chose this rating because this graph shows me the days where I didn't do as well and I can see where I can improve.

Statistic	Value
Total Responses	258

28. How informative do you find each graphic, from 0 (not at all informative) to 10 (very informative)?

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Graphic 1	0.00	10.00	6.62	2.31	265
2	Graphic 2	1.30	10.00	7.28	1.77	267

29. Which graphic do you prefer as a progress tracker?

#	Answer		Response	%
1	Graphic 1		129	48%
2	Graphic 2		141	52%
	Total		270	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.52
Variance	0.25
Standard Deviation	0.50
Total Responses	270

30. If you were monitoring your progress via a desktop computer or laptop, which graphic would you prefer?

#	Answer		Response	%
1	Graphic 1		132	49%
2	Graphic 2		139	51%
	Total		271	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.51
Variance	0.25
Standard Deviation	0.50
Total Responses	271

31. If you were monitoring your progress via a mobile device (phones, tablets, etc.) with a smaller screen, which graphic would you prefer?

#	Answer		Response	%
1	Graphic 1		119	44%
2	Graphic 2		153	56%
	Total		272	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.56
Variance	0.25
Standard Deviation	0.50
Total Responses	272

32. If you were monitoring your progress via a wearable fitness tracker (Fitbit, Apple Watch, etc) which graphic would you prefer?

#	Answer		Response	%
1	Graphic 1		121	44%
2	Graphic 2		151	56%
	Total		272	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.56
Variance	0.25
Standard Deviation	0.50
Total Responses	272

33. Drag the sliders

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Bar chart	1.70	10.00	7.05	1.61	262
2	Line graph	0.00	10.00	6.19	2.10	268
3	Pie graph	0.00	10.00	6.61	2.34	263
4	Table	0.00	10.00	8.08	1.98	266
5	Visual display	0.00	10.00	7.28	1.89	260

34. Which of the following data displays have you previously encountered outside of this survey? Select all that apply.

#	Answer		Response	%
1	Bar chart		211	79%
2	Line graph		206	77%
3	Pie graph		224	84%
4	Table		219	82%
5	Visual display		192	72%

Statistic	Value
Min Value	1
Max Value	5
Total Responses	267

35. Which data display type do you encounter the most often?

#	Answer		Response	%
1	Bar chart		69	26%
2	Line graph		51	19%
3	Pie graph		47	18%
4	Table		56	21%
5	Visual display		42	16%
6	Other (please specify)		3	1%
	Total		268	100%

Other (please specify)
scatter plot
idk
unsure

Statistic	Value
Min Value	1
Max Value	6
Mean	2.85
Variance	2.14
Standard Deviation	1.46
Total Responses	268

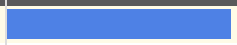
36. Please rate how meaningful you find each data display type in terms of content and layout from 0 (not at all meaningful) to 10 (very meaningful). Choose "Not Applicable" if you are unsure what the data type looks like.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Bar chart	1.20	10.00	7.00	1.60	264
2	Line graph	0.00	10.00	6.47	2.09	267
3	Pie graph	0.00	10.00	6.69	2.20	264
4	Table	0.00	10.00	7.96	1.92	265
5	Visual display	0.00	10.00	7.10	1.90	259

37. Drag the sliders

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Informative	5.10	10.00	8.80	1.27	266
2	Aesthetically pleasing	0.00	10.00	6.80	2.36	265
3	Clear and easy to understand	3.80	10.00	8.88	1.33	266
4	Portable (able to display correctly on multiple devices)	0.00	10.00	6.84	2.30	262
5	Colorful	0.00	10.00	5.63	2.82	262

38. Based on your personal opinion, how many data sets do you believe were used to make the graphs, tables, and other displays used in this survey?

#	Answer		Response	%
1	1		127	47%
2	2		28	10%
3	3		24	9%
4	4		23	9%
5	5		20	7%
6	More than 5		48	18%
	Total		270	100%

Statistic	Value
Min Value	1
Max Value	6
Mean	2.72
Variance	3.90
Standard Deviation	1.98
Total Responses	270

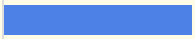
39.						
#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	I consider how things might be in the future, and try to influence those things with my day to day behavior	1.00	7.00	5.39	1.17	268
2	Often I engage in a particular behavior in order to achieve outcomes that may not result for many years	1.00	7.00	4.94	1.35	268
3	I only act to satisfy immediate concerns, figuring the future will take care of itself	1.00	7.00	3.27	1.63	262
4	My behavior is only influenced by the immediate (i.e. a matter of days or	1.00	7.00	3.12	1.48	264

	weeks) outcomes of my actions					

40. For each of the statements below, please indicate whether or not the statement is characteristic of you or of what you believe from 1 (extremely uncharacteristic of you and what you believe about yourself) to 5 (extremely characteristic of you and what you believe about yourself).

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	I prefer complex to simple problems	1.00	5.00	3.37	1.13	259
2	I like to have the responsibility of handling a situation that requires a lot of thinking	1.00	5.00	3.62	1.06	260
3	Thinking is not my idea of fun	1.00	5.00	2.30	1.15	246
4	I would rather do something that requires little thought than something that is sure to challenge my thinking abilities	1.00	5.00	2.57	1.18	245

41. What device are you using to take this survey?

#	Answer		Response	%
1	Desktop computer		105	40%
2	Laptop computer		135	51%
3	Mobile tablet (i.e. Apple iPad)		5	2%
4	Mobile phone		18	7%
5	Other (please specify)		1	0%
	Total		264	100%

Other (please specify)

Statistic	Value
Min Value	1
Max Value	5
Mean	1.77
Variance	0.67
Standard Deviation	0.82
Total Responses	264

42. Which devices have you owned or used? Please select all that apply. (Note: testing a device for a short period of time, such as in a retail store, does not count as "used").

#	Answer		Response	%
1	Apple Watch		19	12%
2	FitBit		42	27%
3	Pedometer		77	49%
4	Other smartwatch		18	12%
5	Other physical activity tracker (please specify)		26	17%

Other physical activity tracker (please specify)
none
App on my phone
Garmin GPS Running Watch
MyFitnessPal App and iphone motion sensor pedometer
My Fitness Pal
none
iPhone health app
Fitness app
none
Health App on Iphone
fitness app on cell
Mobile Application
none
none
Jawbone UP24, UP2, and UP3
na
Apple Apps (ie - Nike Running App)
step calculator
N/A
Garmin GPS Watch
body bug
none
Weight machine
heart rate monitor
smartphone app (Samsung S-Health)

Statistic	Value
Min Value	1
Max Value	5
Total Responses	156

43. Please identify your gender.

#	Answer		Response	%
1	Male		139	53%
2	Female		124	47%
	Total		263	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.47
Variance	0.25
Standard Deviation	0.50
Total Responses	263

44. Please enter your age.

Text Response
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Statistic	Value
Total Responses	263

45. Optional

Please enter your height in feet and inches (I.E.: 5 ft 2 in)	Please enter your weight in pounds (I.E.: 120)
5 ft 3 in	135
5 ft 12 in	128
5ft 1 in	110
5 ft 7 in	130
5 ft 5 in	120
5 ft 3 in	120
6 ft	165
5ft 3in	140
6ft	173
5'9	185
5ft 10 in	150
6 ft 1 in	175
5 ft 4 in	165
5ft 3 in	101
5ft 8in	165
6ft 0 in	185
5ft 8.5in	155
5 ft 5 in	140
5ft 6 in	140
5 ft 6 in	183
5 10	190
5 ft 11in	159
5 ft 11 in	155
5'9	159
5 ft 9 in	155
5 ft 6.5 in	121
5 ft 2 in	125
6'2"	185
5 ft 6 in	145
5 ft 3 in	108
5 ft 5 in	125
5 ft 1 in	100
5 ft 7 in	140
5 ft 7	128
5 ft 10 in	167
6ft	240
5ft 4in	130
5 ft 3 in	118
5 ft in	155
5 ft 6 in	115

6 ft 0 in	215
5 ft 8 in	
5 ft 8 in	140
5ft 11 in	
5 ft 7in	225
5 ft 6 in	180
5ft 11in	149
5ft 2in	152
5 ft 8 in	150
5 ft 6 in	123
6 ft 2 in	170
5 ft 2 in	103
5 ft 10 in	220
6 ft 3 in	165
5 ft 7 in	120
5 ft 10 in	146
5 ft 9 in	170
5 ft 2	103
5ft 7in	145
5 ft 3 in	105
5 ft 7 in	140
5 ft 4 in	150
6 ft 6 in	180
5 ft 10 in	160
5ft 6in	135
5 ft 4 in	128
5'10"	170
5 ft 10 in	150
5ft 11in	160
5 ft 6 in	170
6 ft 6 in	185
5 ft 7 in	140
5'9	180
5 ft 6 in	125 lbs
5 ft 4 in	145
5'5	145
5 ft 1 in	120
5 ft 10	150
5 ft 5 in	150
5ft 2in	112
5 ft 8 in	135
5 ft 4 in	115
5ft 10in	254
5 9	190

6 ft 0 in	175
5 ft 3in	140
5	4
5 ft 9 in	190
5 ft 8 in	138
5 ft 10 in	185
5ft 4in	122
5ft 7in	168
5 ft 5 in	140
6 ft 0	260
5 ft 5 in	175
5 ft 4 in	128
5 FT 4 INCHES	135
6	
5 ft 8 in	130
5 ft 11 in	158
5 ft 9 in	148

Statistic	Value
Total Responses	222

46.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 1	0.00	10.00	6.80	2.42	272

47.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 2	0.00	10.00	8.17	2.27	275

48.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 3	0.00	10.00	4.83	2.75	270

49.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 1	1.50	10.00	7.36	1.94	270

50.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 2	0.00	10.00	6.45	2.71	273

51.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 3	0.00	10.00	5.60	2.36	272

52.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 1	0.00	10.00	6.76	2.65	272

53.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 2	0.00	10.00	6.49	2.79	272

54.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Reaction to graph 3	0.00	10.00	4.37	2.78	269

55.						
#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
5	My convenience is a big factor in the decisions I make or the actions I take	1.00	7.00	4.56	1.53	265
6	I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes	1.00	7.00	5.11	1.34	265
7	I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years	1.00	7.00	5.38	1.32	265
8	I think it is more important to perform a behavior with important distant consequences than a	1.00	7.00	4.78	1.35	263

	behavior with less important immediate consequences					

56.						
#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
9	I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level	1.00	7.00	2.90	1.55	250
10	I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time	1.00	7.00	2.91	1.52	258
11	I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date	1.00	7.00	2.96	1.54	256
12	Since my day to day work has	1.00	7.00	3.72	1.55	260

	specific outcomes, it is more important to me than behavior that has distant outcomes					

57.

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
13	When I make a decision, I think about how it might affect me in the future	1.00	7.00	5.60	1.17	265
14	My behavior is generally influenced by future consequences	1.00	7.00	5.24	1.20	265

58.						
#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
5	I try to anticipate and avoid situations where there is a likely chance I will have to think in depth about something	1.00	5.00	2.37	1.15	244
6	I find satisfaction in deliberating hard and for long hours	1.00	5.00	3.35	1.14	253
7	I only think as hard as I have to	1.00	5.00	2.55	1.19	251
8	I prefer to think about small daily projects to long term ones	1.00	5.00	2.83	1.09	254

59.						
#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
9	I like tasks that require little thought once I've learned them	1.00	5.00	2.92	1.20	249
10	The idea of relying on thought to make my way to the top appeals to me	1.00	5.00	3.68	1.05	258
11	I really enjoy a task that involves coming up with new solutions to problems	1.00	5.00	3.74	1.03	258
12	Learning new ways to think doesn't excite me very much	1.00	5.00	2.17	1.14	241

60.						
#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
13	I prefer my life to be filled with puzzles I must solve	1.00	5.00	3.29	1.20	255
14	The notion of thinking abstractly is appealing to me	1.00	5.00	3.59	1.13	257
15	I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought	1.00	5.00	3.41	1.13	257
16	I feel relief rather than satisfaction after completing a task that requires a lot of mental effort	1.00	5.00	2.91	1.21	252

61.						
#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
17	It’s enough for me that something gets the job done; I don’t care how or why it works	1.00	5.00	2.39	1.16	248
18	I usually end up deliberating about issues even when they do not affect me personally	1.00	5.00	3.40	1.15	257

62. Optional Please write any comments you have about the survey.

Text Response
Some of the questions in the end about thinking about future consequences or whether i like thinking abstractly etc, depended on the situation/how long i had been working on said problem/solution and was at the point i just wanted to find any solution to the problem
Sabatalo.2 Survey was very long, I started to lose my attention span around 2/3 of the way through which I feel could be detrimental to your results if enough people feel the same way.
This survey is interesting but feel somewhat too long.
Hope this helps!
Good survey. Qualtrics is p cool. Good luck analyzing data. Are you using SPSS? Good luck.
very long
This survey was too long- trim the fat (ha ha see that pun?) but seriously some of those questions did not seem necessary
Aughenbaugh.1 = dot number
Interesting survey. I believe you are trying to figure out the best way to present tracked fitness data to help better motivate people to exercise.
I did not like having to answer the same question just worded differently three times.
none
so repetitive it hurtssssss
none
just a couple things, as a college student, unless this is your target audience, there will be a bias. also this is not a simple random sample so there is going to be selection bias there as well. convenience sampling never gives the whole picture, and is often inaccurate. the other thing is that calories in vs out is a naive picture, its very important where the calories come from, and as an avid weightlifter, and someone who use to wrestle, calories are a very naive way to track weight loss/gain progress. its very important to track proteins, carbs, fats, ect....
Way to long
I like that it make me think. It was ironic especially since the end of the survey asked me about thinking. I would be interested in knowing what you are using this data for.
Thought the line graph labeling could have been better worded!
Very long and in depth. Perhaps a warning at the beginning would be helpful for time-constrained people
none
none
N/A
Thanks!
This survey is WAY UNDERPAID! Shame on you!!!!!!!!!!!!!!!!!!!!!!!!
Everything was very straightforward. I liked seeing the different methods of displaying

this kind of information. My worker ID is A22KRF782ELLB0 if it's needed.
none
It was an interesting survey.
It was actually very interesting
Took too much time to complete.
It was way, way too long for the compensation. Not fair at all.
Its really a nice and unique survey about data displays. Thank you.
None
none
enjoyed survey was engaging/interesting and informative thank you for opportunity to participate
its long
nice study
nothing
no comments, thank you
I Love Your Survey. Thank You.
No issues or confusion. Thanks.
none
Thanks!
I hope some incorrect answers on some of the questions does not disqualify me. I think on the first question, i may have stated the incorrect day. I did answer the questions honestly and did not rush. I thought the survey was very interesting! Interesting ways to display the same info. Thank you. Bill
Thank you!
none
Interesting.
none
thanks
none
thanks
none
Colorful and interesting survey. Thanks. All the best.
It was ayt
Interesting survey
best survey
n/a
good Charts for health
Thank you
None
Interesting survey. I like it.
interesting charts
The lively graphics really brought the survey to life.
Good one little long but informative
All the displays were pretty bad and the the methods were questionable. What you should

have done is randomly assign a particular display and asked people to make decisions based on the information provided, not simply ask which they thought seemed clear.
None, but thanks for asking.
The survey is interesting...Thank you
I have not used any fitness tracking devices.
I thought a page or two to complete the survey but it comes page after page.. anyways I decided to take it and I completed it I am satisfied
Please apply a generous bonus to my payment. Today is my 37th birthday. Thank you.
none
I enjoyed participating.
no
Asking questions about graphs without showing me the graph on the same page results in my guessing. I think that's probably counter to what you're working towards. Also, thanks for the work.
Thank you for the opportunity to assist you.
its very nice job
good survey

Statistic	Value
Total Responses	75